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The Copper Statistics

The copper statistics for June, completing the first half of 1911, enable us to make a survey over past periods of sufficient length to show what has actually happened. The comparative figures of production and consumption during the last three semesters are summarized in the following table:

COPPER PRODUCTION AND DELIVERY

Period	Production	Domestic Delivery	Exports
1910 I.....	717,266,550	388,275,896	302,370,739
II.....	734,855,570	361,150,646	420,060,755
1911 I.....	725,659,047	337,285,518	352,969,560

It appears from the above that the production of the refineries has been nearly stationary. The effect of the curtailment by the North American smelters has been wholly masked by the supplies that the refiners have received from other sources. This does not necessarily mean an augmentation to the world's supply, because some copper may have been coming to American refiners that previously went elsewhere, and to some extent that probably has been the case. Moreover, it is to be noted that the production for the first half of July does not include any of the new copper coming from the Bonanza, Miami and Ray mines, none of which had been delivered by the refineries previous to the end of June. So far as the statistics of production up to date are concerned there is at least the satisfaction that they have not increased.

The statistics of deliveries account for the recent recession in the price for copper to under 12c. The domestic figures reflect the contraction in general business in this country, while the exports show the fine progress in Europe. Had it not been for the latter the copper market would have been in a disastrous condition. The extraordinarily large exports in the second half of 1910 indicate that to a large extent they represented a transferral of stock. Taking the figures over the whole 18 months, however, it appears probable that Europe has been in a position to absorb about 60,000,000 lb. per month from this country, a rate that is satisfactory.

Turning now to the matter of stocks we find that the total of 401,278,817 lb. on July 1, 1910, had been reduced to 309,817,373 lb. on Jan. 1, 1911. We then began to include the stock at Rotterdam and Hamburg, previously unreported, which was 48,832,000 lb. on Jan. 1 and raised the actual total to 358,649,373 lb. on that date. On July 1, 1911, this had been reduced to 353,366,964 lb.

Thus it appears that the copper market, which was moving fairly in the direction of improvement in the latter half of 1910, has just a little more than held its own in the first half of 1911. The most encouraging feature is the excellent increase in deliveries during the last quarter. The hope for further improvement in the market rests now upon the maintenance of the European rate of consumption and such increase in the American as will offset the new production coming in from Alaska and Arizona, which will begin to appear during the current quarter, although not perhaps to any very heavy amount.

The International Steel Conference

The International Conference at Brussels last week appears from the cable accounts to have passed off smoothly, with mutual felicitations. Judge Gary's program was generally accepted and steps were taken for the formation of a permanent international institute. This institute is not to be scientific in its nature; it will be composed of the commercial, not the operating or technical heads of the great steel companies. Its objects, according to its chief promoter, are to be consultation and mutual advice, coöperation in trade and, incidentally, the improvement of working conditions and the settlement of labor questions. No "trust" is contemplated, only coöperation.

It does not seem, however, that the world outside the new institute is in-

clined to accept this attractive program without question. There is a general belief that the somewhat vague coöperation outlined by Judge Gary is to extend itself to prices and the regulation of production; and naturally to a division of export trade to the nonsteel-making countries. It is asked how such gatherings of steel makers as are proposed can discuss trade matters in a general way without touching on the all-important questions of prices and competition. These questions, too, are likely, to assume greater international importance now that there is a strong movement in more than one important commercial country toward the breaking down of tariff barriers. It would be idle to suppose that the leading steel makers of the world would travel long distances to meet, and then carefully avoid the discussion of the matters most vital to their commercial success. So far the general impression is probably right, and the International Institute may and probably will have a good deal to say about the regulation of prices and production and the division of trade. The great question is how far can it go, with any prospect of success?

Judge Gary is a thorough believer in the power of combined capital. In our own trade he has had some degree of success in securing coöperation in trade and in regulating prices; though he has met with some sharp checks to remind him that there are economic forces that cannot always be controlled, even by the biggest of combinations. In the larger attempt at control there are many factors to be taken into consideration. National feeling, prejudice and other like sentiments may easily serve to wreck any such combination; to say nothing of ecomonic conditions, which even a "world trust" cannot always afford to despise.

On the face of it mutual intercourse and consultation among manufacturers of different countries may be desirable and beneficial. If the new institute really confines itself to this, there is no fault to be found with it. But if it is to go further, as the general belief is, it is to be regarded with great caution, as possibly a dangerous combination. Possibly it is only, as some people think, a buffer to secure the Steel Corporation and its allies in their "controlled market" against the apparently impending reduction of our iron and steel tariff and to ward off foreign competition. In that case it will probably be an inefficient barrier against the hunger for trade which exists in all commercial countries.

Applying Compulsory Arbitration

Viewed at a distance, compulsory arbitration seems an ideal way of settling labor disputes, and we are treated to encomiums on this subject during nearly every political campaign. We find in the Australian press, however, a record of some of the difficulties arising in the application of its compulsory arbitration law, which is so frequently referred to in other parts of the world as being the ideal solution of the wage question. It seems to be another case of distance lending enchantment.

One of the peculiar decisions arising out of this law was that of Justice Burnside, who declared in effect that a rich mine ought to be compelled to pay higher wages than a poor mine in the same district. Some time after the sensationally rich Bullfinch mine was discovered, about 20 miles north of Southern Cross, the miners working at the Bullfinch demanded higher wages. The owners refused and the men ignoring the arbitration court and defying the law, laid down their tools and went on strike. After a two-months' idleness an agreement was made in Febbuary to run for six months on the Kalgoorlie scale of wages. The company admitted that while the district was a new one the men would be obliged to rough it, and high prices would prevail until conditions became more settled, but it protested against the idea that the mine should be penalized because it happened to be a rich one.

In April the men at the Marvel Loch and some other mines, situated about as far to the south of Southern Cross as the Bullfinch is to the north, demanded a schedule of wages almost identical with that at the Bullfinch. These mines, however, are small and of comparatively low grade, and there were no special conditions such as existed at the Bullfinch. The companies offered certain increases as a compromise, but the union refused. The employers then invited the union to cite a case before the arbitration court. The union declined and the men went on strike, notwithstanding the fact that the unions were largely responsible for the inauguration of the arbitration court.

In the practical operation of the Compulsory Arbitration Act, three phases are noted. (1) When the court grants practically all of the demands of the employees, who, therefore, readily accept its award. (2) When the demands of the employees are only partially upheld by the court and the dissatisfied workers try to get better terms by compromise with their employers under threat of a strike. (3) When the employees or the union officials, knowing their case to be too flimsy to appeal to the court, go on strike, setting the law at defiance.

A contemporary states that this last phase of the working of compulsory arbitration is becoming so common that it will soon be the rule. If the employers attempt a lockout they are heavily penalized, but, with the moderate fines imposed upon the union leaders, the law has repeatedly proved inadequate to prevent the men from going on strike. It is, of course, satisfactory to the employees to have a law that binds the employer hand and foot but which is powerless to touch them when they choose to disobey. If the employees cannot also be made to obey the statute it is evident that a modification is bound to come, as it is hardly practicable to keep on the statute books a law that can be enforced against one class only.

We often read in stock-market reports that the shares of a certain mining company sold off after the payment of a dividend and did not regain the amount. That is entirely normal. The dividends paid by a mine come wholly out of resources that are gradually exhausted. If the value of a share in a company of known resources is a certain number of dollars today, its value is somewhat less after the payment of each dividend. The stockholder cannot eat his cake and have it too. The value of any mining share normally diminishes with the production of the mine. The failure of this principle to obtain more general recognition, however, is apt to cause dividends to be all profit to some shrewd persons, which is obtained at the expense of unwary investors, who buy empty bags at high prices and hold them after the wind has gone out.

Correspondence and Discussion

Prospecting in Colorado

A State-wide effort is being made in Colorado at this time to revive mining by encouraging prospecting, with the hope of revealing new deposits of ore and possibly of finding somewhere in the State a new mining camp.

Denver and Colorado Springs owe their foundation and rapid upbuilding to mining. Not only have the camps near these cities; Idaho Springs, Central City, Cripple Creek and Leadville contributed largely to their prosperity, but also the remote camps; Ouray, Silverton, Telluride, Lake City, Aspen and Creede have added their just proportion of wealth in exchange for machinery and mining supplies. By reference to the magnificent mansions erected and large fortunes amassed in these cities by successful mining men, it will be discovered that their existence is due chiefly to legitimate mining; the wealth was extracted from the ground.

There has been a great tendency in the last few years for mining men to make money from the promotion of mines, rather than to strive for the more economical extraction of the ores and a higher percentage of the saving of the contents. This is in direct contrast to the operations of Colorado's wealthiest mining men; Campion, Moffat, Walsh, Cheesman, Tabor, Stratton and others, who worked their prospects and made mines out of them. Colorado men have succeeded in mining in our State not because they were luckier or had better opportunities than others, but because they were better acquainted with mining as an industry and were more inclined to apply sound business methods to their operations.

There is over the State considerable unexplored as well as unprospected territory, some of which embodies the same geological formations and conditions existing in the older camps; Leadville, Cripple Creek and the Clear Creek district. Doubtless much of this territory will yield immediate results to the prospector's pick and there is a grave possibility of discovering a new camp, as is earnestly hoped for.

However, somewhere along the line of the development of mines out of new discoveries, unless favored by a bonanza strike, the prospector is compelled to procure assistance, financial or otherwise, before he can place his claim on a producing basis. This suggests the division of prospecting into two stages: In the first stage the prospector goes out into virgin territory not necessarily remote from the oldest camps, makes his discovery, locates his claim and in the course of two or three years has his prospect or small mine partially developed. This may be called the pioneer stage. In Colorado there are thousands of claims which have been brought to this point and which have remained idle since the pioneer prospectors, who discovered them, passed away. The second or advanced stage of prospecting is suggested as being the exploitation of prospects or small mines which have remained idle after having been partially developed. This is the most attractive, and if conducted by men of sound judgment and requisite experience, the safest and most remunerative field for mining investment or speculation. It is from just such prospects that the great mines of the world have been made. Thomas Walsh, for instance, made the famous Camp Bird mine out of an old lode claim in Imogene basin which had remained idle for years.

Views, Suggestions and Experiences of Readers

The most successful plan yet employed for the pursuit of the advanced stage of prospecting, has been demonstrated in the San Juan region to be the organization of small syndicates of business men to work together to make mines of prospects. Many of these syndicates have already earned a high percentage of profit by their operations and some have developed into close corporations owning rich mines. Local capital in mining camps is necessarily limited but there is no sound reason why business men of cities all over the United States should not make money from legitimate mining in just this manner. They should capitalize their enterprises for a few thousand dollars and have the ability to raise more if necessary. They should employ a competent engineer to search among the claims under consideration and select those which have a sound chance of being placed on a producing basis. The procuring of a competent mining man is a vital point in the success of the operations of the syndicate. He need not necessarily be a prospector or engineer; he should be experienced and possess sound judgment.

Having secured a desirable property on reasonable terms the syndicate should conduct their operations, not as a gamble, but with the same careful business consideration they would accord their private enterprises. They should place in charge of their mining operations an experienced manager and no one else. They may fail to make a mine of their first selection but succeed in another.

In this manner the members of the syndicate who assume the financial risk enjoy the profits. If their operations become complicated they may change the form of their syndicate into a close corporation for the convenience of their members. The idea is not to organize stock-selling companies. This undesirable feature is done or should be done away with. The appalling capitalizations and other irregularities which have gone hand in hand with the stock-jobbing system can in this way be disposed of and notwithstanding the fact that the public demand seems to be for low-priced stocks on high capitalization, by developing the syndicate idea for the operation of prospects an object lesson will suffice to demonstrate the follies of the stock-jobbing system. There is no sound reason why these syndicates should not be generally successful.

WARREN C. PROSSER.

Silverton, Colo., June 14, 1911.

Vanadium Poisoning

On page 24 of the JOURNAL of July 1, I read an article on vanadium poisoning, taken from the *Journal* of the American Medical Association. The original article has been given considerable publicity through the journal in which it appeared, and is still being copied in the belief that the statements contained are based on facts. I have given the matter considerable attention, and fail to find that there is any such disease as vanadiumism; furthermore, there are no authoritative records of vanadium poisoning arising from external contact with vanadium compounds.

We have been treating vanadium ores for about five years, not only at our mines but at our factory at Bridgeville. We have never had a case of vanadium poisoning either at the mines or at the factory during this time. The workmen at both places are exposed to ore dust and to the intermediate compounds that arise in the treatment of the material from the ore to the finished alloy, ferrovanadium. We now have at our factory a number of workmen who have been with us continuously for four years, and who are now perfectly healthy and who have in the interval exhibited no signs of inconvenience nor of any indisposition

that might be attributed to their contact with vanadium compounds.

The failure to find vanadiumism as a recognized disease can not be due to the fact that vanadium has but recently made its appearance in the industrial field. It is well known that vanadium is a widely distributed element, and that it has been encountered in diverse industrial operations for almost a century. It has been recognized in most of the French pottery clays; in nearly all granites and in the iron ores from many European mines. In the treatment of these ores the vanadium has appeared largely in the slags and in such quantities that these slags have sometimes been used as a basis for its recovery. Caustic alkalis nearly always contain traces of vanadium and in this way the element has been coming into intimate contact with the human cuticle for years and years as a soap, without any reported or harmful effects. Ever since vanadium became a commercial commodity its industrial applications have been growing. First among these applications seems to have been its use as an oxidizer in the manufacture of aniline dyes. It has, I believe, been largely employed as a mordant in the dyeing of fabrics, and as such must remain in the fabric and must there retain its chemical activity to a certain degree. The author of the article on vanadiumism might, therefore, in all probability, be wearing clothes containing a certain percentage of vanadium without being aware of the fact.

Not long ago Beraud, a Frenchman, secured patents for dyeing processes, in which an unusually large quantity of vanadium was actually retained in the fabric for specific therapeutic effects to be derived from wearing these fabrics next to the skin in under garments. Ever since 1875 vanadium has been recognized as an element of *materia medica.* During the later '70's, Doctor J. Crompton Burnett, a noted London physician, published a book in which vanadium compounds were given a high place in the treatment of specific diseases. Since that time there has arisen a veritable school of vanadiotherapy, which, promoted by the investigations of Lyonnet, Martz, Martin, Helouis, Baguslawski, Robin, Manquat, Maragliano and others, has assumed considerable proportions, so that now vanadium is being largely used in medicine, as well as in a wide range of industrial applications, and we have yet to hear of a single case of vanadium poisoning as a consequence.

There are many companies mining vanadium ores, not only in the United States, but in Portugal, Spain, Peru, Mexico and other places, and I have been unable to find any evidence to support the existence of vanadium poisoning or the disease called vanadiumism. During the last five or 10 years these operations have been carried on in an increasingly extended manner, and it seems certain that if vanadium produced an occupational disease, we would have heard of it before this. I have personal knowledge of the use of vanadium as a therapeutic agent, administered not only internally, but hypodermatically, and externally in the form of baths, lotions and compresses, and also by inhalation into the remote cavities of the lungs, and I have discovered no evidences of toxicity or consequent irritability.

The point that I raise is that there is no evidence to support the existence of vanadiumism or vanadium poisoning as an occupational disease, and that the statements as given in the *Journal* of the American Medical Association are unfounded.

GEORGE E. LEES.

Pittsburg, Penn., July 8, 1911.

Steamboat Mountain, B. C.

There was printed in the JOURNAL of June 24, p. 1260, some information relative to Steamboat mountain, B. C. No doubt the correspondent who supplied this wrote in good faith, but recent revelations have caused a revulsion of feeling which may cause public sentiment to swing to the opposite limit to that brought about in some measure by gross exaggerations in flamboyant advertisements printed in provincial newspapers and supplemented by the effusions of human gasometers intent on getting hold of the money of easy victims to their unprincipled methods.

The only exception I shall at present take to what your occasional correspondent stated in his communication is the assertion that "the laws of British Columbia have, to a great extent, protected the camp from the hands of the 'wildcatters,' so that little of that sort of business is going on." If staking mineral (?) claims during the winter while the snow lay deep on the ground, and afterward selling them—against which there has not, so far as I am aware, been any protection is not "wildcatting" of the most reprehensible kind, I do not know what is. The fact is that the prosecution by law of those who are bent on getting money by gross exaggeration and misrepresentation in printed advertisements and in other ways, seldom, if ever takes place in British Columbia. The province of Ontario, fortunately is setting an example that there is room for hope will be emulated by British Columbia ere long. Meanwhile, many credulous people will be deceived and many scamps enriched by the ignorant confidence of the former in the truth of statements promising that much money can be made by buying shares in the so called mining companies. Portland Canal gold, Queen Charlotte Islands coal, Tulameen diamonds, Steamboat mountain gold and their like are prominent influences against the legitimate development of the mineral resources of this province in districts as yet unproved. Not that there are no promising mining properties in the Portland Canal district, for there are several being developed with much promise; nor indications of productive coal measures on Graham island, for these undoubtedly exist; but that unprincipled promoters have published gross exaggerations, and thus far with impunity.

Getting back to Steamboat mountain—it does not follow that there will not yet be found orebodies containing valuable metals in sufficient quantity to make it practicable to establish remunerative mining enterprises in that district. It is true the camp will in the immediate future be much handicapped as a result of recent charges that Greenwalt and Stevens, whose "strike" was mentioned by your occasional correspondent, "salted" the claims sold to Vancouver men; also that much reprehensible misrepresentation has taken place concerning other claims. Further, it is unfortunate that men of good repute have reported their inability to find ore returning assay value high enough to warrant them in recommending their respective clients to spend money in the camp. The worst that should be said is that thus far the alleged richness of ores in the camp has not been found to exist except, possibly, in isolated instances. But this is not necessarily conclusive, and doubtless there are those who, thinking so, will give parts of the camp a fair trial. Then, too, the Geological Survey of Canada is sending Charles Camsell, an experienced and thoroughly reliable mining geologist, into the field with his three assistants to spend the summer there. I, therefore, suggest to all concerned that neither the gross exaggerations of the past nor the keen disappointment of the present felt by some, be accepted as a reliable indication of the actual position, for a few months hence there will be available independent and dependable testimony relative to the general conditions observed and the value or otherwise of many samples of mineral he will have gathered from various parts of the field.

E. JACOBS.

Victoria, B. C., July 1, 1911.

Spraying to Allay Dust

In the multitude of articles on the dangers of dry mines, I have seen but little of the dangers of wet ones. I believe that the hookworm is entirely unable to go through its cycle of changes in dust or dry ground. Will not our mines, if kept as wet as the reformers wish, be nothing but hookworm-breeding grounds, when once the parasite is introduced, which, owing to the nomadic habits of miners, it is almost sure to be?

JOHN GRAHAM.

Denver, Colo., July 7, 1911.

Dr. Holmes' Visit to Alaska

WASHINGTON CORRESPONDENCE

Dr. Joseph A. Holmes, Director of the Bureau of Mines, has left Washington to visit Alaska. This trip is at the instance of Secretary Fisher, of the Department of the Interior, who wishes to be informed of the situation in Alaska from the expert mining standpoint. Doctor Holmes is accompanied by the newly appointed inspector of mines for the district of Alaska, who will go over the ground in company with him. The visit is also of considerable importance from the point of view of congressional action. It was the purpose of the Senate committee on public lands to go to the Territory for the purpose of examining into conditions with a view to legislation on the Alaskan situation next winter. Senator Nelson, of Minnesota, planned to be there at the same time with Director Holmes. A change in this project was necessitated by the fact that the extra session of Congress is holding the members of the committee in Washington so long as to put it out of the question for them to visit the Territory. They will, therefore, probably not go there, but will be guided a good deal by the information brought back by Doctor Holmes.

Fundamentally, the question to be raised will be whether the Government ought to alter the laws relating to the passing of public lands, especially coal lands, into private ownership or whether it should adopt some plan for the leasing of the lands to individuals upon a share basis. In support of the opinion that the latter plan will be commended by the Department of the Interior is now cited the fact that Secretary Fisher, who was instrumental in settling the street-railway controversy in Chicago, effected a settlement there upon precisely that basis, it being his proposal that 55 per cent. of gross receipts should be paid to the city government by the railways. That he will recommend some similar plan to the congressional committee with respect to Alaskan lands is the belief of some who are close to him and to the committee, but the precise form of the recommendations will depend largely upon the report made by Doctor Holmes when he gets back from the Northwest.

It is now felt by members of Congress that it will be impossible to defer definite legislation on Alaska beyond next winter, owing to the urgency of the Administration for some final disposition of the question, and that it will be desirable to have the problem disposed of in some manner before the coming on of the next Presidential campaign. One project which is being discussed in the "progressive" circles of the Senate is the actual construction of all railways in Alaska by the Government, the roads then to be leased to private capitalists to be run under conditions carefully prescribed by law. This is a topic which will be taken up in connection with the coal-land legislation, inasmuch as it is now felt that, without proper provision for transportation, it will be impossible to get satisfactory operation of coal lands. Doctor Holmes will also be questioned by the committee about this phase of the Alaska situation upon his return and will probably be asked to make a report on the subject. On the way to the Pacific coast Doctor Holmes will look into the question of establishing a new mine-rescue station in Colorado, as he has been requested to do, and will also attend a meeting of the board of experts which is to decide what is to be done to settle the controversy regarding the smeltery fumes. This board will meet in Butte, Montana.

Precious Metals Corporation

SPECIAL CORRESPONDENCE

Several buildings have been erected on the property of the Precious Metals Corporation, at Weedon, Quebec, during May and June, and options have been secured on several hundred acres of adjoining land. A total of 15,000 tons of ore have been shipped to date, which averages over 5 per cent. copper, 42 per cent. sulphur and 40 per cent. iron. During May and June No. 2 shaft has been sunk 65 ft. in ore, which all averages over 5 per cent. copper with the sump at present in 10 per cent. copper and 43 per cent. sulphur ore. At depth the iron in the crude ore continues to run about 40 per cent. and the holding up of the sulphur contents in face of the high copper percentage is explained by a less percentage of insolubles. The run-of-mine ore as shipped averages less than 15 per cent. of fines over ¼-in. mesh.

A system of crosscuts show the commercial ore to be lenticular in shape, the major axis being 500 ft. and the minor 50 ft. There is strong evidence that the mineralized zone cropping on the surface contains several such lenses, as a second has been cut in the underground work. The walls of the main fissure are schist, while those of the orebodies are casings of quartz and schist. These bodies have the same strike and dip that the country rock has, N, 40 E, and dipping 45 deg. to the southeast. Stoping is being done by the shrinkage system.

E. E. Haskel, of Tucson, Ariz., is engaged in a preliminary survey for a railroad spur about four miles from the mine of the main line of the main line of the Quebec Central Railroad. This spur will join the main line at either Weedon or Stratford, according to which route is most feasible, but the company rather expects that the line will be run to Stratford. Leland D. Adams, formerly with the Miami and Ray companies, has been in charge of the property since April 1. The development at the mine is proceeding at the rate of four tons developed for every ton extracted.

Mining in the Black Hills

SPECIAL CORRESPONDENCE

According to a statement given out by Assayer in Charge L. P. Jenkins, of the United States Assay Office at Deadwood, the office purchased gold bullion, during the quarter ended June 30, amounting to $1,889,000. This amount is greater than for any similar period in the history of the office, and reflects the satisfactory condition of the mining industry in the district. Aside from the Homestake, which is the largest depositor at the Deadwood office, the Mogul, Lundberg, Dorr & Wilson, Golden Reward and Wasp No. 2 were large producers of bullion. In point of bullion production the Black Hills has shown an increase month by month for the past year, and with a number of new producers starting or about to start, it is probable that the production will be still greater.

Bullion producers in the Black Hills were dismayed a few weeks ago when it became known that the director of the mint had ordered the local assay office to double the "assaying and stamping" charge, which is deducted on all bullion purchased. This would make a difference of $1.25 per $1000 on all bullion purchased. Local people immediately took the matter up with Senator Gamble, of South Dakota, and after an interview with the director of the mint the order was rescinded. The enforcement of the increase in the charge would have undoubtedly caused a number of the producers to ship their bullion to the Denver mint, at a considerable saving in charges, but a material delay in receiving payment.

Alaska Coal Bill

WASHINGTON CORRESPONDENCE

A development following closely upon the recent decision in the case of the Cunningham coal claims has appeared in the form of a bill introduced into Congress by Delegate Wickersham, of Alaska. This bill, if passed, will virtually create a national coal reserve in that territory. It provides that 15,000 acres of coal land, to be equally apportioned among the three coal-bearing districts, Katalla or Bearing river, Matanuska and Alaska peninsula, shall be immediately reserved from entry by the President; and that as soon as the selection of these lands has been made, all other coal lands in Alaska shall be open to entry and sale under United States laws applicable in Alaska. In regard to the latter, however, several provisions are made.

The Government expressly reserves all powers in connection with the fixing and

regulation of the price which any individual or corporation shall charge for the sale and transportation of any coal mined in Alaska; and it further stipulates that it reserves the power to regulate and punish conspiracies which may operate in restraint of trade, in almost every conceivable branch of the coal industry.

Looking forward to the time when it will be necessary to divide the Territory into States, the bill states that the Government may authorize any such State to exercise any of these powers over any such lands that may lie within its boundaries. In brief, these conditions run with the land. Every patent which the United States shall issue for any land in Alaska, regardless of whether the land was located and entered before or after the final passage of the proposed bill, must contain these terms and conditions, and, in addition, those contained in sections two and three of the act of Congress entitled, "An act to encourage the development of coal deposits in the Territory of Alaska." This latter act was approved, May 28, 1908.

Poderosa Mine

The annual reports of the Poderosa Mining Company, of Collahuasi, Chile, are always of interest, inasmuch as this company is probably the largest producer of high-grade copper ore in the world. In 1909 its output was 25,782 tons, averaging 18.36 per cent. copper, which realized £181,211. In 1910 the shipments of ore amounted to 23,341 tons, averaging 21.5 per cent. copper, and a little over 7 oz. silver per ton, of which the net proceeds, after payment of freight, insurance, smelting charges, etc., were £191,871.

The gross profit for 1910 was £55,872, compared with a loss of £24,877 in 1909. The profit in 1910 was derived almost entirely from operations during the last six months of the year, as during the first half of the year operations were carried on under abnormal conditions, the mine being partially shut down for several months to allow of the enlargement and timbering of the shaft, installation of cages, pumps, etc., the completion of various outside work, and the cleaning out and retimbering of many of the underground workings. The net profit for the year was £38,471.

In March, 1911, the company again met with adversity, an unprecedented rainfall causing the flooding of the mine, which turned out to be more serious than at first believed, owing to the numerous falls of roofs of large extent in the workings, which greatly delayed the unwatering and cleaning up of the mines. Some of the openings are now in good order, though others are still full of water. However, the directors anticipate that the profit during the current year will be satisfactory, barring further accidents.

The Federated Malay States

The Mines Department of the Federated Malay States has completed its report for the year 1910, which shows a decrease in the results of operation, as compared with 1909.

Tin

The production of tin was the smallest reported since 1900, and was 10 per cent. less than in 1909. The total quantity of tin reported from each state was, in pikuls:

	1909	1910	Changes
Perak	461,665	421,335	D. 40,330
Selangor	266,007	240,192	D. 25,815
North Selangor	48,072	34,697	D. 13,375
Pahang	43,143	40,674	D. 2,469
Total pikuls	818,887	736,898	D. 81,989
Long tons	48,743	43,863	D. 4,880

Of the total quantity for the year, 166,315 pikuls were exported as black tin and 570,583 in tin ore.

As regards labor conditions, the Mines Department states that there is no reason to doubt that laborers employed in mining earned a comfortable living, and there is also no reason to doubt that rates of pay showed a general tendency to increase; but it is practically impossible to ascertain what percentage of the whole wages bill the actual increment amounted to. The mining-labor market was undoubtedly affected by the absorption of labor on rubber estates, especially during the active period of the rubber boom; but the actual numerical extent of this is again intermediate. The rise in wages was no doubt also due to rubber operations. In any attempt to judge the condition of the tin-mining industry by inspection of the labor returns, consideration must be given to two controlling factors, short supply of labor available and that capital possessed by persons who usually invested in mining became locked up in rubber investments, and they were unable to take advantage of the rise in the price of tin.

Tungsten and Gold

The total export of wolfram was 1580 pikuls; of scheelite, 52 pikuls; of the wolfram 1003 pikuls were from Perak and 577 from Selangor.

The production of gold in Perak, 898 oz.; in Pahang, 15,869; total, 16,767 oz. The Raub Australian mines, in Pahang, mined and crushed 55,137 tons of ore, saving 14,570 oz. gold. The ore was of higher grade than in the previous year.

Coal Mining

Preliminary operations were carried on in the Rawang coal area, and an adit is being run by the Rawang Federated Malay States Coal Syndicate, Ltd., a London corporation. Results are uncertain as yet. The coal found in the outcrops is lignite, of fair quality.

Smelting Plants in Utah

The International Smelting and Refining Company's new plant at Tooele with its modern equipment is mentioned as destined to play a large part in the development of the local smelting industry. The present daily capacity for copper ores is 1500 tons, while the lead furnaces now being built will handle 500 tons.

The United Smelting, Refining and Mining Company's plant at Midvale, including the wet concentrator and Huff electrostatic zinc plant, has a smelting capacity of 1200 tons of lead ore and 1800 tons of copper ore daily. The smelter was completed in 1902 at a cost of about $3,000,000. This company was the first to errect a baghouse to control the fumes leaving the stack, and recovers arsenic and several other byproducts. In addition to its custom business, the company operates and smelts ores from the Centennial-Eureka and Bullion Beck mines in Tintic, and the old Jordan, Galena, Niagara and Telegraph mines in Bingham.

The American Smelting and Refining Company began operations in Utah in 1898, when it took over the old Germania, Hanauer, the Ibex Smelting Company of Leamington and the Pennsylvania plants, then working on lead ores. In 1902, the Murray plant with a capacity of 2200 tons of ore was built at a cost of about $1,250,000. There are eight blast furnaces and 27 roasters. The Garfield plant of the A. S. & R. was built in 1906 for the treatment of copper ore and has a daily capacity of 4500 tons.

When the addition to the mills of the Utah Copper Company are completed and the Bingham & Garfield railroad open for traffic, this company will be able to handle 20,000 tons of ore daily. In 1910, 89,000,000 lb. of copper were produced by this company and it is planned to produce 150,000,000 lb. annually within two years. The company owns 665 acres of mining claims in Bingham, 1586 acres at the mouth of Bingham cañon, 3377 acres at Garfield, and 509 acres in Utah county. It has developed an ore area of 166 acres, its mining equipment consists of 22 steam shovels, 45 locomotives, 344 dump cars and 32 miles of railroad in its stripping and service tracks. In 1910, 82 per cent. of the ore was mined by steam shovels and 18 per cent. by underground methods. In the last eight years the company has expended $9,664,850 in the development of its mining property and the construction of its mills. During the same period it has paid dividends amounting to $9,153,424.

Utah now stands third in the States in the production of lead ores, second in the production of silver, fourth in copper and sixth in gold, notwithstanding that the mineral resources of the State have scarcely been touched.

Details of Practical Mining

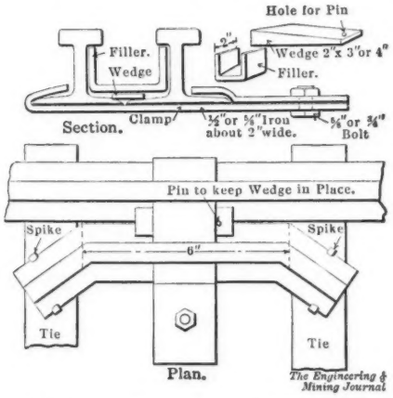
This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

Short Guard Rail and Fastening

BY G. M. SHOEMAKER*

The accompanying sketch shows a guard rail and method of fastening that has been found to be satisfactory. A shorter piece of rail may be used in making it than with the older method. The purpose of a guard rail is to guide



METHOD OF FASTENING A GUARD RAIL

the flange of the wheel away from the point of frog and 6 in. of rail should be sufficient to do this, 3 in. on either side of the point of frog. With the old method it is necessary to use a much longer piece to get sufficient spiking surface to make the rail fast.

In the old method it is necessary to drive the spikes between the outer rail and the guard preventing the base of each from meeting unless notches are cut in the bases. By this method the ball of each rail is brought closer together thereby making the liability of derailment less, especially so in the case of a bent axle or a wheel which has become wobbly from wear on bore or axle.

A piece of rail 12 to 18 in. long may be used making it possible to use scraps which are often thrown away. The clamp, filler and wedge can be made by any blacksmith and the material in many cases can be found in the scrap pile. The guard rail and its fastenings are light, making it easy for the track layer to transport them from the shop to the place where they are to be used. I have two cases where the guard rail is only 8 in. in length and no spikes used and the guard is answering the purpose, no derailments having taken place.

*Mining engineer, Pennington Gap, Va.

Coal Mine Survey Methods for Metal Mines

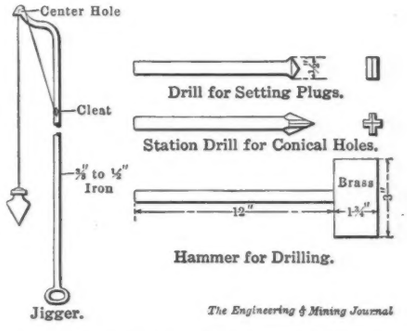
BY K. T. WHEELER

Coal-mine surveying is usually simple, consisting for the most part in running straight lines and turning simple angles. A great volume of work is, however, required owing to the rapid progress made in mining. The methods used must be accurate but at the same time rapid. The method of putting in stations and "giving sight" to them, used in the anthracite field is well worth the attention of metal-mine surveyors. The method is especially applicable where a resurvey of old workings is required, or where a large volume of work is to be done on one level. It saves much time in rock drifts, obviating the necessity of placing plugs and spuds at every station. Also where the roof or back is high, it saves carrying ladders or "horses" with which to reach the stations after they have once been established.

In this method a small conical hole ¼ to ½ in. deep and ⅜ in. diameter, is drilled in the roof or back using a small drill and hand hammer. This is done by the fore-sight man in a few minutes even in the hardest rock. This hole is the station and a circle is painted about it, and its number placed close by. In "giving sight" a "jigger" or iron rod with a bent top the end of which closely fits the conical hole, is used. A brass plumb bob is carried suspended from the jigger and the fore-sight man steadies the bob and is ready to give sight by the usual method of holding a light to shine on a knot in the string or the point of the bob. The vertical angle and the measurement is taken to this knot or the bob point. If the fore-sight man is experienced, the choosing of the place for a station and its establishment is accomplished while the instrument is being set up.

With a properly and accurately constructed jigger and with proper manipulation, these survey points are as accurate as the plug and spud stations and have the advantage that they are not subject to displacement. They are easily found if the painted circle is kept fairly fresh and are not, as might be supposed, easily mistaken for other indentations in the rock. Their regular round shape makes them easily distinguishable from small cavities or fractures in the rock. Stations neglected for years in the old workings of the coal mines are readily found unless the rock is so wet as to obliterate all paint marks.

In order to secure good results, the hole for the plumb-line must be accurately centered in the point of the jigger and this point should not be too thick. The jigger point and the drill used should be compared so that the one will fit closely into the hole made by the other. If these precautions are observed, and the operator is careful to hold the instrument in a nearly vertical position facing the transit, there will be no lack of accuracy.



SURVEYOR'S STATION-CUTTING TOOLS AND JIGGER

Both back-sight and fore-sight men carry jiggers, the one carried by the former being usually shorter than the other. The reason for this is that the fore-sight man must fix a point on the floor over which the transit is set up. To do this he kneels and, holding the jigger with his right hand, he steadies the lowered bob with his left, then slowly releases the string held by his right hand until the bob touches the floor. A bit of the white paint carried for numbering stations is daubed on the bob point so

that upon touching the rock placed on the floor for that purpose, it makes a white point over which the instrument can then be set. By carefully locating stations they can always be put above the car rail and no rock is required. All this takes a certain amount of skill but a boy can soon be trained to do the work quickly and accurately. The back-sight jigger may be shorter and thus easier to carry since it is never used from a kneeling position.

The length of the jiggers will, of course, vary with the hight of opening in which they are used. They might easily be constructed to be adjustable in length, if the work requires it, though personally I have never seen this done. Any blacksmith can make these instruments in a few minutes. The time saved by using this kind of station instead of plugs with spuds, may be estimated from the fact that a corps of four men will put in from 35 to 80 per day. This includes establishing the station, measuring the distance, reading both horizontal angle and taking the detail such as widths right and left, distance to crosscuts and so forth.

Plug and spud stations are used only when it is necessary to leave points from which plumb lines may be hung to give the miners a line to follow in their work. These plugs are of soft wood about 1½ in. long and ½ in. diameter and are driven tightly into holes drilled with a small drill and hand hammer. These small plugs hold spuds quite as well as the larger, so often thought necessary in metal mines, and their setting requires but a fraction of the time.

The instrument methods and general scheme of procedure differ from the methods usually employed by metal-mine surveyors. The procedure with a four-man corps is as follows: The fore-sight man chooses a place for the new station, establishes it, gives sight and then "plumbs the station," that is locates with the bob a point on the rail over which the transit can be set up. The chainman has meantime come up dragging the 300-ft. tape. He takes the measurement to the point of the bob or knot in the string which, of course, must be in the same position as for sight. The fore-sight man is then through and is free to go ahead to locate a new station. The chainman calls out the distance and then laying down the tape returns along its line and takes the distances to various crosscuts. He paces, or measures with a pocket tape, the widths right and left at these points. The instrument man acts also as the recorder. The back-sight man gives back-sight and holds the rear end of the tape at the instrument.

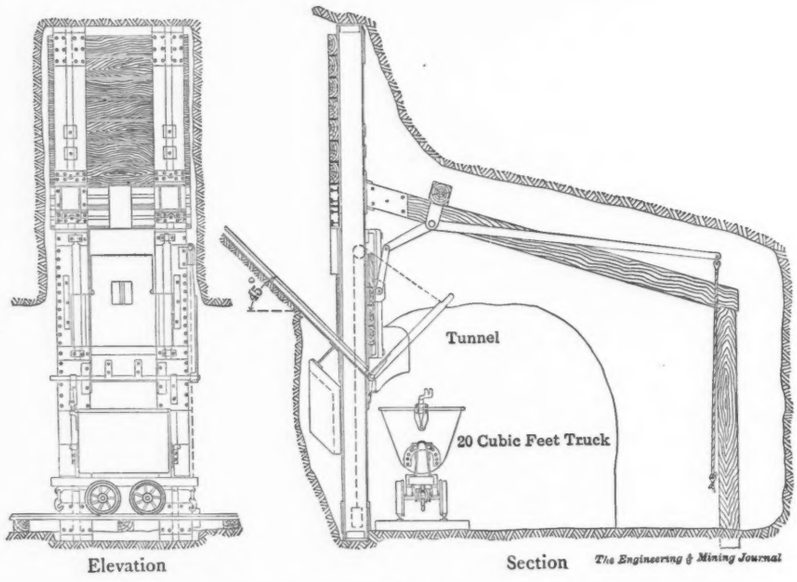
The transit work is simple. An azimuth or continuous vernier traverse is run, that is the bearing is carried with the instrument and the back-sight is always taken with the plates locked in the same position as for the previous fore-sight, but with the telescope plunged. The same vernier is read always. In beginning the traverse the vernier is set on the bearing of the first course as determined from the mine survey book. The bearing of the line from the back-sight to the station set up on is this first course. The telescope is plunged for the back-sight and the horizontal angle turned with the telescope in its normal position for the fore-sight. The bearing of the new course can then be read directly. The limb of the instrument has an inside and outside graduation. The inside gives the quadrant, reading to the right from 0 to 90 deg., and so on around the circle. The outside graduation is continuous clockwise from 0 to 360 deg. All readings are taken on the inside but the outside graduation determines the quadrant. Thus a reading of 43 deg. 15 min. on the inside circle is recorded north 43 deg. 15 min. east, if tween 90 and 180 deg. on the outside circle; south 43 deg. 15 min. east, if between 90 and 190 deg. on the outside circle, and so on. All traverses are closed. The compass is always read as a check.

This system, like all others, has its advantages and disadvantages. It has been adopted in the coalfields apparently because it is purely mechanical, and instrument men not technically educated can be easily trained. It is rapid and simple, and if each traverse is closed, as all mine traverses should be, to show any accidental errors from slipping of the plates, it is effective. The advantages are that bearings may be read and recorded directly without calculation; office work is saved and "ties" are made quickly. The disadvantages are the liability to error from slipping plates and the danger of making wrong readings when the vernier is near the zero points. Thus north 0 deg. 5 min. east might be read north 0 deg. 5 min. west. Not all instruments are graduated in this manner and unless they are the advantages are largely lost.

The columns of the left-hand pages of the note book are headed: Station; Magnetic Bearing; Horizontal Angle (true bearing); Vertical Angle; Slope Distance, and Horizontal Distance (calculated in the office). The right-hand pages are used for sketches and notes. Leveling is done at another time, using a wye level and extension rod.

A Steel and Timber Ore Chute Gate

The ore-chute gate shown in the accompanying illustration is described by Alpheus F. Williams,[1] and is in use in the Kimberley diamond mines of South Africa. The bottom of the chute is lined with rails put close together and forming a surface inclined at 45 deg. leading downward to the opening into the haulage drift. This opening is closed by a strong steel-front structure in which the loading door is placed. Two steel side uprights made of 12 by 6 in. I-beams are connected at top and bottom by plates. The base is built into a concrete foundation at a level with the floor of the tunnel, and the tops of the uprights are hitched into the roof of the tunnel. These uprights serve to carry the front of the loading box which is formed by steel channels, rails and timber bolted across the uprights.



CHUTE GATE USED AT KIMBERLEY DIAMOND MINES

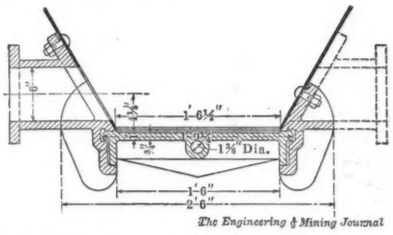
The discharge door is made of ½-in. steel plates with 3-in. timber packing be-

[1] "The Kimberley System of Handling Large Quantities of Ground in the Minimum of Time, with Notes Regarding the Life of Wire Ropes," read before the South African Institute of Engineers.

tween. The door is of the sliding type and is guided between angles and rails to lift vertically. Immediately under the door opening is a movable lip by means of which the amount of the discharge from the door is regulated. The door and lip are operated by separate hand levers.

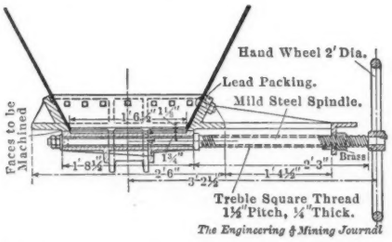
Discharge Door for Filter Vats

In the cyanide plants of Western Australia water is so scarce that every economy must be practised to husband the supply. Sufficient water is not available at some of the mills to discharge the filter vats by sluicing as is the usual practice in the United States.



CROSS-SECTION OF HORIZONTAL FILTER-VAT DISCHARGE DOOR

Where it is required to discharge the residue into the pond in the form of a pulp as thick as can be handled, the hopper-bottom filter vats are situated directly over a residue vat provided with a mechanical stirrer, into which the residue from the filter vats can be discharged and then be mixed with a minimum quantity of water.



LONGITUDINAL SECTION OF HORIZONTAL FILTER-VAT DISCHARGE DOOR

The type of door used in the bottom of the filter vats is shown in the accompanying illustration. A cast-iron flange is riveted to the bottom of the hopper of the filter vat. The frame of the door, which is also made of cast iron, is bolted to the flange. The door itself is slightly wedge-shaped and slides in grooves so cut that when the door is closed it presses upward against the flange closing the opening so tightly that no leakage occurs. When the door is opened there is no obstruction to prevent the free passage of the thick sludge through the orifice. The door spindle is bolted to the door casting and is cut with treble square thread of 1½-in. pitch so that quick opening is possible. The door is operated by a 24-in. handwheel.

The time taken to discharge the residue is about ten minutes and the discharge door may be closed and the cycle of operations in the filter vat be resumed while the stirrers are mixing the thick pulp in the vat below, preliminary to discharging to the pond by means of belt or other conveyers.

The Cost of Breaking Ground

The costs of breaking ground, given in the accompanying table, are taken from the Ready Bullion, 700-ft. Claim and Alaska-Mexican reports for the year ended Dec. 31, 1910, and from the Alaska-Treadwell report for the year ended May 31, 1909. The costs, in all cases, include such work as was done in developing, and breaking waste as well as ore for the mill.

COST OF BREAKING GROUND AT DOUGLAS ISLAND, ALASKA

	Ready Bullion	700 Ft.	Mexican	Treadwell
Average number of drills used	10.12	11.586	14.917	39.13
Tons ore broken	151,460	238,696	232,875	830,551
Tons waste broken	2,756	.....	10,509	1,670
Tons broken, total	154,216	238,696	243,384	832,221
Total footage drilled	241,679	269,990	362,519	803,542
Tons ground broken per machine per shift:				
Stoping	47.36	42.998	41.26	.....
Developing	8.65	11.323	6.58	.....
Cutting-out	14.30	7.334	10.34	.....
Average	23.06	30.41	24.19	28.47
Footage drilled per machine per shift:				
Stoping	29.39	33.587	33.50	.....
Developing	39.14	37.78	39.71	.....
Cutting-out	40.11	33.954	34.79	.....
Average	36.12	34.37	35.7	29.41
Tons broken per foot of hole drilled:				
Stoping	1.61	1.28	1.23	.....
Developing	0.22	0.19	0.165	.....
Cutting-out	0.31	0.33	0.30	.....
Average	0.64	0.88	0.669	0.96
Costs of breaking ground per shift per machine:				
Labor	$8.35	$6.96	$7.52	$7.23
Explosives	2.43	2.84	3.05	2.85
Supplies and power	4.96	4.55	4.93	*4.80
Total	15.74	14.35	15.50	14.88
Cost per foot of hole drilled	0.44	0.42	0.434	0.506
Cost per ton of ground broken	0.682	0.47	0.64	0.522
Total cost of mining, including development	1.0271	1.2079	1.2198	1.1361
Percentage of total mining cost	66.7	38.9	52.4	46.0

*Estimated.

The ore of Douglas island is a mineralized igneous rock of fair hardness, the workable portions of which vary upward from 30 ft. in width. The stopes are carried up as great rooms and machine drills with large piston diameters, up to 3¾ in., are used in stoping. The width of the stopes and power of the machines are principally accountable for the large tonnage of ore broken per machine per shift.

Resistance of Reinforced Concrete to Explosives

The extraordinary resistance of reinforced concrete to violent shocks is shown in a recent article in *Ferro-Concrete* on the experiments made in France at the Liévin gallery for investigating coal-dust explosions. Another striking instance was furnished by the explosion of two gas-storage drums at the reinforced-concrete factory of the Prest-O-Lite Company, Indianapolis, resulting in practically no damage to the building where the explosion occurred, but the roof of a building 25 ft. away fell, and the walls of another building 100 ft. distant were cracked. In the reinforced-concrete building, the only damage consisted of the hole in the roof, the size of the drum base, and work was resumed half an hour after the explosion occurred.

Oil and Gasolene Engine Costs

Data regarding the cost of oil and gasolene engines are soon to be published as a bulletin by the Foos Gas Engine Company, from the advance sheets of which the following is taken. Comparison is made between a Foos engine using kerosene at 5c. per gal. and a gasolene engine using 12c. fuel.

A 10-hour day with a 25-h.p. oil engine at full load shows a fuel cost of $1.55. A gasolene engine under the most favorable conditions would use 31¼ gal. of fuel, which at 12c. would cost $3.75. A total saving for 300 working days would give the oil engine a lead of $660 per year.

As a matter of fact, the advantage in favor of the oil engine is shown to be even greater. Kerosene can be bought as low as 4c. and in many fields oils are available at 2¼c. The Foos company claims that nothing is sacrificed to gain this economy and that 25 years' experience enables it to produce an oil plant with all the durability and reliability of a steam engine.

The International Steel Conference

The international meeting of representatives of the iron and steel trades, held in Brussels, Belgium, July 5 and 6, was the outcome of the general meeting of the American Iron and Steel Institute held in New York last year, to which a number of prominent men from different European countries were invited. The visitors were subsequently taken on an extended round of visits to steel works in this country. While no action was then taken to organize an international association, the plan was discussed freely, and arrangements were made for the meeting which has just been held.

At this meeting, on July 5, the steel manufacturers of America, Canada, England, France, Germany, Belgium, Italy, Austria and Spain were represented by 160 delegates, all prominent in the trade. The conference elected as its chairman Judge E. H. Gary, chairman of the United States Steel Corporation. In his opening address he stated the objects of the meeting.

A meeting of American and European steel makers to arrange for "Mutual Information and Co-operation." Are prices and production to be included?

Purpose of the Organization

Judge Gary explained somewhat fully his views concerning coöperation in business. "Suppose," said he, "that a company of men engaged in business and possessing much capital, power and influence should by their conduct, unjust or oppressive, secure universal disapproval, disgust and antagonism on the part of the public. In a brief space of time these men would be driven out of business.

"Suppose a producer of any commodity for sale should in any way within his power ill-treat all his customers. How long would it be before the producer would be in bankruptcy?

"Suppose an employer of labor manifestly treated his employees unfairly and poorly. In time, as a result of the action of those interested, aided by public sentiment, a remedy would be found, and this after great interruption of business and loss of money.

"Again, let us assume that during a given year the demand for a product equals less than one-half the capacity to produce, and yet each producer is greedy and anxious to sell more than his fair proportion and acts accordingly, and this attitude is maintained until it is destructive. Results which we all know are almost certain to be realized."

It would be difficult, Judge Gary continued, to bring about an ideal in business, yet a right disposition, courage, patience and the application of the highest thought might reach that position. The first essential to this was thorough acquaintance and frequent intercourse.

"There should be established and continuously maintained," Judge Gary said, "a business friendship which compels one to feel the same concern for his neighbor that he has for himself. It is no less in principle than the Golden Rule applied to business. Is it possible? If it is it will be certain to pay. True it is that sometimes, and too often, deceit is practised and that advantage has been taken by those who have obtained the confidence of others, but this fact should dishearten no one.

"For example, take any two men in this room engaged in competitive business, but who are sufficiently acquainted to have the entire confidence of each other. Is there any doubt that in the daily conduct of their affairs neither would be disposed to do anything unneighborly or unreasonable toward the other, or that the acquaintance would bring to both better results than could be realized if they were unfriendly or engaged in bitter and destructive competition?

The Value of Association

"If they are in frequent discussion on questions in which they are interested, freely interchanging opinions and frankly disclosing conditions concerning their business, will not the individual conclusions reached by each naturally be of a higher order and more satisfactory in every particular?

"Argument, if sound, applies with greater force whenever a large number of persons are in the habit of meeting one another with the same spirit of friendship which exists with reference to a smaller number."

Judge Gary then sketched conditions in the United States. Americans, he declared, were anxious to be and to keep near to their European friends. It had been the expressed wish of many of the representatives present to form an international association for the interchange of opinions and information between the iron and steel producers of the world concerning all questions relating to the industry, an organization distinguished from and broader in the scope of its activities than the existing great and splendid institutions. He believed it feasible. Necessarily it should be formed and managed so as to avoid the antagonism or interference of any other institution and so as to obtain the approval of public sentiment.

Discussion of the Plan

Following the opening address there was a general discussion of the proposed organization and its purposes and possible methods. The general plan was approved and indorsed by a number of the speakers. Among them were Baron von Bodenhausen, of the Krupp works, speaking for Germany; Sir Hugh Bell and Sir John Randle, for Great Britain; Herr Kestranek, for Austria; M. Diex, for France; M. Greiner, for Belgium; T. J. Drummond, for Canada; M. Arninonbrod, for Hungary; M. Wittmer, for Russia; besides J. A. Farrell, Charles M. Schwab, Willis L. King and E. A. S. Clarke, from the United States.

A resolution was adopted approving the organization of an international institute for general conference and the maintenance of mutual understanding.

The Committee on Organization

On the following day, July 6, it was voted to appoint a committee of 30 representatives of the different nations to prepare a plan for the permanent organization of the institute. Judge Gary was made chairman of this committee. The other members from the United States are: James A. Farrell, president of the Steel Corporation; Charles M. Schwab, president of the Bethlehem Steel Corporation; E. A. S. Clarke, president of the Lackawanna Steel Company; Willis L. King, vice-president of the Lackawanna Steel Company.

The conference then adjourned, subject to the call of the committee. The intervening time will be spent in visits to important European steel works.

Comments on the Conference

It is hardly flattering to the presentation of the objects of the conference as made at the meeting, that there seems to be a general assumption that the objects of the institute go much beyond mere consultation and friendly coöperation. The opinion expressed is that the real objects are a world-wide regulation of prices and ultimately a division of competitive territory. Prominent German papers discuss it from the point of view of the control of prices and production. The German delegates, it is said, favor the plan because its adoption will assist in the reorganization of the German *Kartels* or syndicates in the trade, which is now in progress. Others oppose it as tending to limit the extension of Germany's foreign trade.

The London *Iron and Coal Trades Review*, a few days before the conference, said: "During the week the American delegates to the Brussels International Conference of iron and steel makers have

been the guests of a committee of British iron and steel makers, with the Duke of Devonshire as chairman. Everyone, whether connected or not with that committee, will wish a hearty welcome to our distinguished American guests, who have always shown British visitors to the Republic great attention and hospitality. Opinions, however, differ as to the merits of the price-maintenance proposals which presumably they come to advocate before a gathering of the iron and steel makers of Great Britain and the Continnent. Apart entirely from the objects underlying the proposal, if its success has been at least doubtful as applied to one country, surely the chances of failure as applied to several countries are much greater."

In concluding its comments the *Review* says: "It is not so long ago that the American price-maintenance system was being held up as one which could readily be followed by other countries and by the world at large, in international relations. A considerable section of the American public apparently regards it after all as only a makeshift to avoid the law; and doubts are multiplying as to whether it is succeeding in doing that."

The Hecla & Torch Lake Railway

J. Parke Channing, in a communication to the New York *Sun,* said that the original Hecla & Torch Lake railroad was built in the late '60's with a gage of 4 ft. 1 in., the last mile of it being a double-track inclined plane operated by wire ropes, the descending loaded rock cars pulling up the empties. In the early '90's this incline was replaced by a longer curved line over which powerful locomotives handled the rock cars in long trains, and finally within the last few years the gage has been made standard 4 ft. 8½ in., and the old 4½-ton wooden rock cars have been replaced by modern 40-ton steel underbody cars.

In 1890 the Hecla & Torch Lake railroad, although only 17 miles in length, probably was the most substantially built railway in America. It had 80-lb. rails, ties 8 in. deep, and 18 inches of crushed-rock ballast. No trunk line at that time equaled it. Its peculiar gage, 4 ft. 1 in., came in the early days when the Calumet & Hecla was just starting and was poor and had purchased to begin with a second-hand locomotive from the Atlantic Mining Company, which had this odd gage.

But even this was an accident. The Atlantic company decided on a 4-ft. gage for the rock road from mine to mill, and in the spring began construction and ordered a solitary locomotive. In the autumn, when the locomotive came up by boat on Lake Superior—and this was the only means of reaching the mines in those years—it was found that by a shop error the gage was 4 ft. 1 in. It was impossible to change it, and so in a great rush one rail on the new road was moved out 1 in. and the 4-ft. 1-in. gage established as a standard in the Lake Superior copper country for many years.

A California Dredge for Alaska Placer Tin

By Lewis H. Eddy*

The first placer-tin dredge for operation in North America and, so far as known, the first on the Western hemisphere, was built by the Union Construction Company, 604 Mission street, San Francisco, for shipment to Alaska June 26. This dredge is to be installed on Buck creek, 14 miles north of York and about 100 miles northwest of Nome, by the York Dredging Company. It is expected to be in commission in time to make a 20-days run before the close of the season, which is coincident with the Nome season.

Details of Dredge

This dredge differs from the California type gold dredge only in the saving parts and in that it has no tailing-stacking conveyer. The hull is of wood, 60 ft. long, 30 ft. wide, 6 ft. deep. Both anchor line and spud are employed; the spud is of wood with steel point, 18 in. by 24 in. by 32 ft. The digging ladder is 51 ft. long, equipped with 35 open-link buckets of 2¾ cu.ft. capacity, designed to dig 14 ft., the buckets dumping 18 to 20 per min., and outputting 1000 cu.yd. per day of 24 hours. The material is loose stream gravel, six to eight feet in depth, overlying slate bedrock, and ranging from sand and pebbles to boulders of three to six inches. The mass is dumped from the buckets into a revolving screen, 17 ft. long, 4 ft. 6 in. diam., with three-in. perforations, and washed with nozzles placed at the lower end of the screen. The coarse material passes to a sorting conveyer, the finer material to sluices. There are two sets of sluices, so arranged that the cleanup of one progresses while the other is receiving material, allowing continuous operation of the dredge. A belt conveyer is arranged for conveying the concentrates from the sluices to a bin where it is sacked for shipment.

The power is to be furnished by three Union gasolene engines: bucket drive, 40 h.p.; 10-in. pump, 40 h.p.; electric lighting plant, 7½ h.p. The engines will consume 140 gal. No. 1 engine distillate in 24 hours, costing seven cents per gal. in drums at San Francisco, plus water freight to York and cost of company haulage from York to the placers, making a total cost of engine fuel not to exceed 20c. per gal. at the dredge.

*State Mining Bureau, San Francisco, Cal.

The dredge operation will employ a total of eight men on each shift of 12 hours; the regular dredge crew will be three men on a shift; the cleanup, three men; and two Eskimos at the sorting and picking belt. Skilled white labor is paid 62½c. per hour and board; Eskimo unskilled labor, about $2 per day and board. The cost of board is $1 to $1.25 per day per man. The company pays transportation both ways for white labor engaged in the States.

The machinery and buckets of the dredge were made in San Francisco; the hull was framed in Seattle, for shipment early in July; and the provisioning of the men and teams contracted for in Seattle. To land this freight at York it will be necessary to take up a lighter from Nome for lightering the load from the ship a distance of about 2½ miles, to a point 200 or 300 ft. off shore, where it will be loaded on wagons. The bed of the shore water is compact sand and gravel, making easy haulage, and the rise in elevation from York by wagon-road to a three-fourths mile divide between the upper end of Anaovik river and the upper end of Grouse creek, a distance of 5½ miles, is about 150 ft.; thence for the balance of the 14 miles the road is down grade, following Grouse creek.

Situation of Tin Placers

The company's tin-placer lands extend a distance of 3½ miles by 100 to 160 ft. wide along the course of Buck creek to the confluence of Sutter creek. Buck creek is a branch of Grouse creek, carries 400 to 500 in. of water and flows northerly, emptying into Mint river which has a westerly course to the Arctic ocean, passing through Lopp lagoon on the northerly shore of Cape Prince of Wales. These placers were initially located for gold. Early miners complained of a heavy substance foreign to gold getting into their sluice boxes and were ignorant of its mineralogical character and unaware that it was valuable until the U. S. Geological Survey made a determination from samples and pronounced it cassiterite. Discoveries of similar aggregations of stream tin[1] were reported in 1901 on Anaovik river and Buhner creek in the same (York) district, about 10 miles east of Cape Prince of Wales. Recoveries from these placers were reported at 150 to 200 lb. cassiterite per cu.yd. In 1908 four places on Seward peninsula were prospected for tin[2], East mountain, Buck creek, Cape mountain, and Lost river.

Prior to the present undertaking on Buck creek by the York Dredging Company several companies were formed to work this channel for tin, on a commercial basis, by various methods, in-

[1]"The Mineral Industry," Vol. X, p. 638.
[2]*Ibid*, Vol. XVIII, p. 664.

cluding horse scrapers, steam scrapers, and shoveling-in. O. H. McDonald, superintendent for one of these companies, in doing assessment work by shoveling into sluice boxes, made recoveries ranging from 30 to 50 lb. and as high as 57 lb. cassiterite per cu.yd. and as high as $1.10 in gold per cu.yd. in addition. But this gravel was taken chiefly from the center of the channel, and the recoveries were no doubt much higher than an average across the channel. The records show that up to the present time 200 tons of cassiterite were recovered from these placers and shipped to Liverpool for smelting, and sale. The present company estimates from reports of engineers and prospecting that the gravel should average 20 lb. cassiterite per cu.yd., or about $6 in value per cu.yd. of gravel dredged; and on this basis will undertake to mine these tin placers with a modern bucket-elevator dredge.

Field operations are in charge of W. W. Johnson, president of the company, while G. W. Payne, secretary and treasurer, is in charge of the head office at San Francisco. The initial product will be shipped to Liverpool; but the company has taken up the matter of smelting future production in California. The saving in freight rates will approximate 50 per cent. The rate from York to Liverpool is $8 per ton, and to San Francisco about $4 to $4.50 per ton. Approximately 4000 to 5000 tons of tin are consumed on this coast annually, at a price 1½c. per lb. in advance of the New York market. The company purposes offering its product to this market in the event of successful outcome of the dredging operation.

Magdalena District, New Mexico

SPECIAL CORRESPONDENCE

There is great activity and steady production of shipping ore at several different mines in the Magdalena district, which is noted for the beautiful specimens of minerals which occur in the mines. The dumps of the Kelly mine alone would supply a sufficient number of fine specimens of copper and zinc carbonates to stock several museums. The principal zinc minerals found here are zinc carbonate or smithonsite, accompanied by hydrozincite and monheimite, which occur in brownish to green botryoidal or stalactitic masses, showing a radiated crystaline structure. Smithsonite is found within cavities and in yellowish brown or buff masses, due to metasomatic replacement of limestone. The primary sulphide from which the oxidized zinc ores are derived is sphalerite. Associated with it are pyrite, galena and chalcopyrite. The lead minerals are chiefly the carbonate, cerrusite, the sulphide, galena, and the sulphate, anglesite.

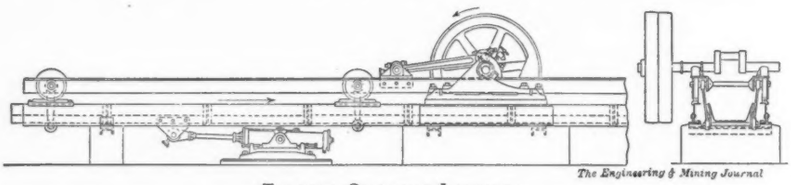
The report just issued by the U. S. Geological Survey contains the following: "This district is in the central-eastern part of Socorro county, New Mexico. The chief metal of the district was zinc, but considerable lead was produced, and also some copper, silver and a little gold. The production of zinc in 1909 was 12,878,241 lb., valued at $695,425, as compared with 3,325,446 lb., valued at $156,296 in 1908, and with 676,356 lb., valued at $39,905, in 1907."

In addition to the foregoing the production of lead in that camp, according to the same authority, for 1909 amounted to about $132,000, and while the Government has not made its report for 1910, yet the total production was more than for 1909, and it is probable that the production for 1911 will be still greater. It is noteworthy that all of this is being done so quietly that the mining world in general scarcely hears of this camp.

The Torpedo Shaking Launder

BY ALFRED GRADENWITZ*

The torpedo shaking launder, a transporting device designed by Amme, Giesecke & Konegan, of Brunswick, Germany, operates on a principle which is somewhat novel in one of its details. Because of its simplicity and efficiency, the launder is said to be well adapted for conveying bulk goods of any size. For this reason it permits one type of transporting device to be used for horizontal conveyance in the various departments of a manufacturing plant, and this tends to reduce maintenance charges.



TORPEDO SHAKING LAUNDER

The rollers of a truck, to the axles of which are fixed short pendulums carrying the launder proper, travel on a substantial iron frame. This truck moves with a reciprocating motion, imparted to it by a crank gear driven by a belt pulley, and the motion, in turn, is transmitted by the pendulums to the launder. A compressed-air cylinder, placed underneath the frame, and to which the launder is connected, acts as a buffer in retarding the motion of the latter in the transporting direction. The motion in the opposite direction is free. By suddenly retarding the motion, any material which is in the launder is shot forward. By repeating this operation the material is, in time, carried the full length of the launder or any desired partial distance thereof. While the rate of advance varies with the speed of the pendulum and the weight of the material, on the standard type of machine any advance up to 0.5 m. is obtained with each oscillation. With 42 r.p.m. of the crank gear, this advance is at the rate of 21 m. per min. By slightly inclining the launders, the material may be transported in an ascending or descending direction, as desired. To guard against wear, the rollers travel on a case-hardened lining, instead of the rail proper.

The launder itself is made up of sheet-metal sections, which are held in a channel-iron frame. For the purpose of discharging at points short of the end of the launder, intermediate slides, to be opened as desired, can be provided at these places. If these openings do not cover the whole width of the launder, it is possible to discharge at several places at once. Due to small wearing surfaces and lubricated ball bearings, well protected against the entrance of dust, the wear is small and the operation smooth.

The apparatus can be installed either standing or suspended, the latter form being more desirable for use in mines. Extensions can be made at either end, the drive and air cylinder inserted at any point desired, and either belt transmission, electric or compressed-air power used for driving the crank gear.

The following are the main data of a model designed by the constructors: Length of launder, 98 m.; stroke of crank gear, 200 m.; revolutions of connecting rod, 52 per min.; advance of material with each oscillation, up to 0.5 m.; advance of material per minute, up to 21 m.; output, crushed stone, 35 tons per hour; power, 5 horsepower.

*Regensburgerstrasse 3, Berlin, Germany.

Retiring Korea's Coinage

Another step in the disappearance of Korea from the map is being taken in the retirement of Korea's coinage. The steamer "Seneca," of the Standard Oil fleet, recently brought 1400 tons of it to this country and much more is to follow. These coins, like the Chinese, were round with a hole in the center, but have all been broken before coming to this country, so that there is not even a chance for the numismatist to secure a few souvenirs. The refining of this old coinage is being done by the U. S. Metals Refining Company, at Chrome, N. J., and an equivalent amount of copper is immediately sent abroad.

The Santa Gertrudis Cyanide Mill

By W. Weston*

The Santa Gertrudis silver mines, acquired by the Camp Bird, Ltd., are being prepared for large extraction. The Guadalupe mill, a converted patio plant, and a new 60-stamp mill, will treat the ore.

*Consulting mining engineer, Mexico, D. F.

Attention was drawn to the famous Camp Bird mine when a few months ago the company, finding that its rich orebodies were approaching exhaustion at depth, purchased the Santa Gertrudis silver mine in the Pachuca district. From a recently reported discovery of a parallel vein, however, it would appear that the Camp Bird mine may have a much longer life than was anticipated. In any case a description of the work now being carried on in the Mexican property will doubtless be of interest, especially as the new mill of 600 tons capacity will have started operations before this is published.

In the first place I must explain that there are two entirely separate companies, one owning and operating the mines of the Santa Gertrudis Company, and the other doing a custom milling business, including the Santa Gertrudis ores, under the title of the Compañia Beneficiadora de Pachuca. The latter company is operating the present mill situated at the Hacienda de Guadalupe in the town of Pachuca, and has also just completed and started a new 60-stamp mill situated about three miles from Pachuca near the Santa Gertrudis mine.

Santa Gertrudis Company, Ltd.

Since the acquisition of the Santa Gertrudis group of mines in January, 1910, by the above company, formed under the direction of Camp Bird, Ltd., of London and Colorado, a progressive policy of equipment, development and preparation of the mines for large extraction has been followed, subordinating thereto the production of ore.

At the time of purchase the 17th level was but partly developed, but has since been completely opened. The 18th level, 35 meters below, has been largely developed against a heavy flow of water; and sinking to the 19th level, 50 meters below the 18th, is well under way. The San Guillermo shaft was not in use, and was in a partly caved condition. It has since been relined with masonry from the collar to the 9th level, the dividers and end plates in this section being steel, and from the 9th retimbered with 12x12-in. sets placed 3 ft. centers. From the 13th to the 15th levels masonry and steel have again been used. From a point just below the 15th level to the 16th, the shaft has been turned from vertical to an incline of 60 deg., thereby making a compound shaft. The shaft, from the top of the compound to its present point of sinking below the 18th level, is in hard ground, and timbered with 10x10-in. sets, 1.75-m. centers. The portion of the old vertical shaft between the 15th and 17th levels is now used as a pocket for waste from sinking the inclined shaft.

It is proposed to use the San Francisco shaft only for handling men and materials, and the San Guillermo shaft only for hoisting ore. The 300-h.p. hoist at the latter shaft operates in overbalance with a 5-ton skip. The San Francisco shaft is equipped with double-decked cages. Practically all the ore from the mine will be hoisted from the San Guillermo shaft, although some production will be obtained from the San Juan shaft, the collar of which is about 60 m. below that of San Guillermo, and the ore therefrom will be trammed to a pocket at the latter shaft by electric haulage.

The most important equipment has been the installation of four electrically driven compressors having a combined capacity of 4800 cu.ft. of free air per minute; two 300-h.p. electric hoisting engines, one at the San Francisco shaft, and one at the San Guillermo shaft; a 70-ft. steel headframe with 500-ton reinforced-concrete ore bin at the San Guillermo shaft; two timber-frame shops, one at the San Francisco shaft and one at the San Juan shaft; electric haulage, using three-ton locomotives, connecting the San Juan with the San Francisco and San Guillermo shafts through the main tunnel; complete equipment of the mine with various sizes of rock drills; a number of 50-h.p. electric sinking hoists; several electric centrifugal pumps; and a number of air-operated Cameron sinking pumps.

Cia. Beneficiadora De Pachuca, Ltd.

The Guadalupe mill consists of a converted *patio* plant, the old chilean mills having been retained, tube mills added and a cyanide plant substituted for the *patio* process. The ore for this plant is brought down from the mine by the Pachuca Railroad Company a distance of about 2½ miles, in 10-ton flat-bottomed cars drawn by Shay engines. The fines are hauled separately from the coarse ores, the screening being done by the mine sorting grizzlies. The coarse ore is put through a Blake crusher, mixed with the fine ore and trammed by hand to the mill bins, and fed to 14 slow-speed, stone-wheel, steel-tired chilean mills equipped with ½-in. screens and belt driven by electric motors. The effluent pulp passes through four Dorr classifiers, the slime therefrom going to eight 15x45-ft. Pachuca tanks and the sands to three 5x22-ft. tube mills, each belt driven by a 100-h.p. motor. Each tube-mill discharge is returned to the Dorr classifiers by means of a 10x54-in. Frenier pump.

Old Mill Uses Moore Filter and Zinc Shavings Precipitation

The slime from the classifiers is elevated to the Pachuca tanks by means of a centrifugal pump. The eight Pachuca tanks are operated continuously in series, the discharge from the last tank of the series being elevated by a short air lift to the two 15x30-ft. storage tanks, supplying a 300-ton Moore filter plant. Precipitation is effected by means of zinc shavings. The precipitates are usually clean, running about 78 per cent. fine bullion. The bullion produced runs about 920 fine, of which about 915 parts are silver. The precipitates are melted in coke-fired crucible furnaces, the resulting bullion being shipped to the Compañia Afinadora de Metales, in Mexico City.

The new mill near the Santa Gertrudis mine will receive its principal supply of ore from the Santa Gertrudis Company through its San Guillermo shaft. The ore, after having been dumped by the skip into the 500-ton concrete bin situated at the San Guillermo shaft, is transported therefrom by means of a 30-in. Robins belt conveyer running 100 ft. per min. and divided into two sections, one horizontal, 500 ft. long, the other on a 12-deg. incline, 175 ft. long. The second section of this conveyer discharges on to a 30-in. flat distributing belt conveyer which in turn discharges into the crushing plant ore bins of 900 tons capacity. These ore bins feed into two No. 6 gyratory crushers, the discharge therefrom passing to a 40 in. by 14-ft. revolving screen, the oversize from this screen passing through two No. 4 gyratory crushers and joining the undersize on a 22-in. Robins conveyer, speed 206 ft. per min. This conveyer is equipped with a Merrick weightometer which automatically and accurately records the weight of the ore handled by the conveyer.

This 22-in. conveyer discharges over the first one of three Vezin samplers where a 10 per cent. cut is taken and discharged into a receiving sample bin of 15 tons capacity. The reject falls on a traveling flat belt conveyer for distribu-

tion into the battery bin of 2500 tons capacity. The sample from the first Vezin is fed from the 15-ton bins through a stack of 26x15-in. rolls; reducing it to about ½ in. and finer. Below the rolls a second Vezin sampler cuts out 10 per cent., the sample tripping into a Challenge feeder which discharges into the third Vezin sampler, which takes a 20 per cent. cut. On a 600-ton basis the sample is now 1.2 tons and is dropped into a small bin and fed therefrom through a set of 9x9-in. sample rolls, quartered and passed through Jones riffles, and thereafter is reduced in the usual manner. Rejects from the second and third Vezin samplers, and from the final quartering, etc., are returned to the battery bins by means of an 8-in. elevator.

Stamp and Tube Mill Crushing

The battery consists of sixty 1550-lb. stamps, arranged in units of 10 stamps each, each 20 driven by a 65-h.p. motor belted to one jack shaft. The 10-stamp units have belt tighteners. One-fourth-inch screens will be used on the batteries. Crushing will be in solution, the solution feed coming from one main large steel launder, situated on top and running the length of the battery bins. This feed launder secures its supply from the two 40-ft. diameter by 20-ft. deep solution storage tanks at the top of the mill site.

The pulp from the batteries will pass to six primary Dorr classifiers, the sand discharging to six 5x16-ft. tube mills, the discharge from which will be returned to the primary classifiers by means of 10x54-in. Frenier pumps, one pump to each tube mill. The slime discharge from the primary classifiers flows to eight secondary Dorr classifiers, the sand discharge of which goes through four 5x20-ft. mills, discharge of which is returned to the secondary classifiers by means of 10x54-in. Frenier pumps. The slime overflow from the secondary classifiers constitutes the finished product from the mill and flows to a set of five primary 35-ft. diameter by 12-ft. deep Dorr thickening tanks, where the pulp is thickened from about 12 to 1, to 1 to 1. The thickened pulp from the primary Dorr tanks goes to the first battery of eight 15x45-ft. Pachuca tanks operated continuously in series. The discharge from the last tank in the series is by means of an air lift into a launder where four parts of barren solution are added to wash, and the thin pulp sent to three secondary 35x12-ft. Dorr thickening tanks, where the pulp is again thickened and returned by gravity to a second battery of ten Pachuca tanks of the same (15x45-ft.) size operated continuously in series, the discharge from the last tank passing by gravity to two storage tanks 35x12 ft., equipped with mechanical agitators.

These storage tanks feed by gravity four 90-frame Merrill slime presses, under 35 lb. pressure; size of leaf, 4x6 ft., and width of frame, 3 in. The pulp slime from these presses, about four parts of water to one of slime, will enter two 35-ft. diameter by 15-ft. deep Dorr thickening tanks, where between 2½ to 3 parts of water will be recovered and returned by pump to the 40-ft. diameter by 20-ft. deep water-supply tank at the top of the mill site. The solutions to be precipitated will be clarified by first passing through two 40-ft. diameter by 10-ft. deep settling tanks, equipped with peripheral launder overflows, and then through two 40x10 ft. sand filters.

Zinc Dust Precipitation

Precipitation will be effected by the Merrill zinc-dust process, and although the solution will be of one grade it will be precipitated in two circuits, the first circuit passing through two Merrill zinc-dust presses and precipitated to barren, and the second circuit passing through four similiar presses but precipitated only down to about 10 to 15 grams of silver.

By this method the minimum of zinc dust will be used in the large or four-press circuit and a higher grade of precipitate obtained. The precipitate will be melted in a battery of eight oil-fired, No. 400 crucible furnaces, arranged on the arc of a circle, and served by a radial jib crane. The pots or crucibles will be raised or lowered by means of an air cylinder situated on the post of the crane.

All pumping of solution and water is concentrated in two pump houses, one located below the Merrill filter plant, and another and larger house below the precipitation plant. The pumps are of the vertical triplex-plunger type, are gear-driven by motors and are installed so that one pump is always in reserve for two circuits. No elevation of pulp is required throughout the plant, except in the case of the Frenier pump returns and of the air lift from the last tank of the first series of Pachucas.

Steel and concrete construction has been used practically throughout the plant, which is situated on a slope of about 17 deg. and is served from top to bottom by an inclined tramway electrically operated. Complete machine, blacksmith, carpenter and electrical shops with large storehouse have been provided and will be served by the inclined tramway. Side tracks at various levels lead from the tramway to the various floors of the mill and to the shops, so that repairs can be easily and quickly made. I am much indebted to Hugh Rose, general manager of the Santa Gertrudis properties, by whose courtesy I am enabled to send you the foregoing description of the work being carried on.

The Brinton Arsenic Smeltery*

The Brinton arsenic mine and smeltery are situated at Brinton, Floyd county, Va., about 14 miles southeast of Christiansburg. The mine was discovered in 1901 and erection of the smeltery begun in March, 1902. The brick required in building the plant were made and burned on the property, and the lumber cut there. Manufacture began in 1903 and continued intermittently for several years. In 1910 a company was organized to manufacture paris green and other insecticides at Norfolk, Va., from the products of this mine, but in March, 1911, the plant was not yet running.

From the ore pile the rock is run through a Blake crusher, from which it goes to a 10x20-in. Stuyvesant roll; from the roll it goes to a rotary calciner—a large iron tube, 50 ft. long by 6 ft. in diameter, lined with firebrick for 30 ft. from the furnace, which is fired with wood. The charge is treated 45 minutes at a temperature of about 800 deg. F. From the calciner all the gases are drawn through a chambered flue 7 ft. high, 6 ft. broad and 319 ft. long, ending in a tall stack. At intervals of 5 ft. baffles cross the flue alternately from each wall to points within 2 ft. of the other wall. The alternate contraction and expansion and the cooling of the gas current are said to settle the arsenious oxide so completely that none reaches the last five apartments. In this form the arsenious oxide is a dirty gray powder containing sulphur, iron and probably other impurities. The draft in the flue is governed by an electric fan, controlled by a rheostat sensitive to barometric pressure.

After a sufficient amount of crude arsenious oxide has accumulated in the flues, they are opened and the oxide is removed by hand and taken to the refining furnace. The furnace is a brick reverberatory fired with coke, and volatilizes 1400 lb. of crude arsenious oxide in 2½ hours. The sulphur remaining with the crude arsenious oxide is converted to SO_2 and most of the other impurities are left behind as a residue. After passing through the calciner the white arsenic is caught in a flue similar to that used for obtaining the crude product. From the refiner flue the white arsenic is taken by hand to a 32-in. Waldron burstone mill, and after being ground it runs to an automatic weighing and barreling machine. The white arsenic made is said to have carried 99.975 per cent. of arsenious oxide.

The Amalgamated Zinc (De Bavay's) Company, of Broken Hill, Australia, has recently paid its first dividend of 1s. per share.

*Abstract from *Bull.* 470-E, U. S. Geol. Survey.

Tonopah-Belmont Cyanide Plant

By Claude T. Rice

Although the mill is antiquated in some respects, certain improvements, such as the use of tube mills and air lift agitation, and the heating of cyanide solutions to 90 deg. F., have brought the extraction up to 92 per cent., 27 per cent. of which is recovered by concentration.

The rapid advancement in cyanidation during the last three years has rendered the Tonopah-Belmont mill, as well as its neighbor the Desert mill of the Tonopah Mining Company, which it resembles to a considerable extent, somewhat antiquated. Still, as the Belmont company has kept the mill well in the advance of silver-cyanide practice in regard to high extraction by judicious changes, such as are quite applicable at other plants originally designed to treat half sand and half slime, the mill is worthy of detailed description.

The heating of the cyanide solutions to a temperature of 90 deg. F. has aided considerably in increasing the extraction, but fully as important has been the adding of two tube mills so that now 60 per cent. of the ore is treated as slime instead of 50 per cent. as formerly. This has thrown a greater load on the slime plant but by using Dorr thickeners for collecting the slime, some of the slime collectors have been rendered available as agitation vats, while by the addition of air lifts to the flat-bottomed vats (but in a different manner than at the Desert plant), not only has the efficiency of the agitation been increased mechanically, but also chemically through better aëration of the solutions. Moreover, by using air lifts to circulate the solutions during the leaching of the sand charges, extraction in that department has been increased through better aëration of the charge as well as because of the longer leach possible on account of the smaller proportion of the ore going to the sand vats.

Character of Ore

The ore treated at the plant is a sulphide in which the gold and silver occur mainly in the arsenical and antimonial sulphides, polybasite and stephanite. There is some pyrite, chalcopyrite and pyrargyrite, as well as a little argentite, while the gangue is mainly quartz. Some sphalerite is met with, and there is a certain amount of manganese occurring mainly as the silicate, rhodonite. The gold occurs locked up in the sulphides, and there is about one-third gold and two-thirds silver on a monetary basis, or by weight about 90 parts of silver to one of gold.

The ore averages about $27 per ton, but as the silver- and gold-bearing minerals occur scattered through the gangue rock in an uneven manner, it is not considered advisable to try to sample the ore, as is done at the Desert plant with its oxidized feed, which is much more even in grade. In order to get an accurate sample, the ore would have to be crushed much finer than it is economical to break it before sending it to the stamps. Instead, in calculating the extraction, the head assay of the ore is obtained by computation from the amount of gold and silver leaving the plant in the tailings and that recovered as bullion and in the concentrates. As a guide in adjusting the treatment to the ore passing through the mill, lip samples are taken at the batteries to determine its approximate grade.

The Belmont mill is at Millers, 13 miles from the mine, which is at Tonopah, as when the mill was built in 1907 it was not certain how much water would be available at Tonopah. The new mill that the company contemplates erecting will be built at Tonopah near the mine shaft.

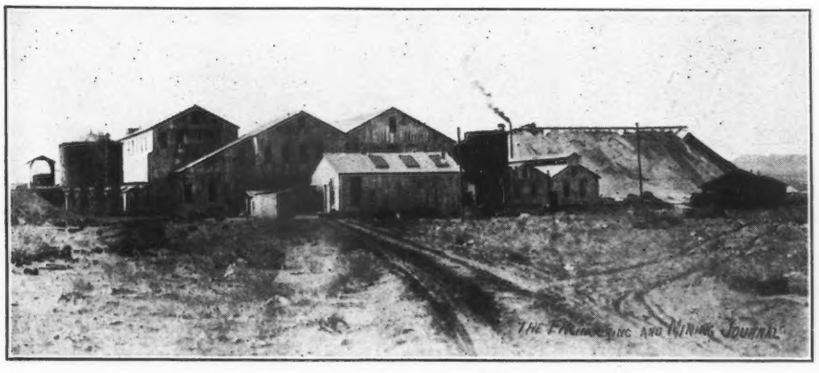
Gates Crushers and Stamps Used

The ore goes from a small receiving bin, surmounted by railroad tracks, to a No. 6 Gates gyratory crusher which breaks it to 2-in. size. This broken ore is then elevated to a revolving trommel with 1-in. holes which feeds its oversize to a No. 4 Gates gyratory that sends its product to the inclined belt conveyer which takes this recrushed ore and the undersize from the trommel to the battery bin where a traveling tripper distributes the ore in front of the 60 stamps. The ore is fed into the batteries by a modified form of Challenge feeder, in which a grip ring, instead of spring pawls, is used to rotate the feed plate.

The stamps weigh 1050 lb. and make 104 six-in. drops per minute. A No. 630 Tyler ton-cap screen, equivalent to 24 mesh, is used on the mortars. These screens last about 30 days. The crushing is done in solution having a strength of 5 lb. KCN per ton, and 3.7 tons of ore are crushed per stamp in 24 hours. The heads for the year 1910 averaged about $27.50, mainly in silver. Half of the gold and silver is taken into solution, or recovered by concentration before actual leaching and agitation begin.

Manner of Adding Lime to Ore

The lime used to neutralize the ore is slacked in a box on the battery floor, but it is not fed to the solution until after the pulp has passed the tables, as this lime would probably have a tendency to clog the battery screens and coat the decks of the Wilfley tables more than would be the case when the solutions entering the batteries have only a small protective alkalinity. Linoleum covers on the tables were found to rot quickly so that a covering of 10-oz. canvas saturated with P. & B. paint is now used, as it lasts much better. The canvas does not present as good a surface for concentration as does the linoleum, but this is a minor consideration as concentration is only resorted to at this mill in order to remove enough of the cyanicides and copper to prevent subsequent reactions from being interfered with. It is cheaper in ultimate cost to cyanide as much of the sulphides as possible, while there is a considerable advantage arising from the fact that the company receives full mint value for the gold in the bullion, whereas for the gold in the concentrate it receives only $19.50 per ounce from the smelter. The lime used in the neutralization of the acids in the ore is



Tonopah-Belmont Mill at Millers, Nev.

easily brought into the mill by passing it through the crushers and up the inclined belt conveyer to a separate lime bin alongside the battery bin.

The pulp from the batteries goes to a sand wheel as is characteristic of South African practice. These tailings wheels cost considerable to build, but they are far more reliable in operation and are cheaper to run than elevators or centrifugal pumps, both as to power and upkeep. For instance, in three years this wheel has required no other repairs than a new driving belt and an ocasional set of laces. The wheel elevates 1200 tons a day, a hight of 48 ft., and requires 7 h.p. The drawback of tailings wheels is the large floor space occupied, but at cyanide plants this is largely compensated for by their great reliability.

Fine Grinding and Concentration

The sand wheel feeds the pulp to six classifiers, the underflow from which goes to an Abbé tube mill, 4 ft. in diameter and 16 ft. long. The discharge from the tube mill, together with the overflow from the six classifiers, goes to nine Wilfley tables where concentrates, middlings and tails are made. The tails from these tables flow to a second sand wheel, which feeds the pulp to the settling cones that separate the pulp going to the cyanide department into sand and slime. The middlings from these first tables go to a bucket elevator which raises them to three Wilfley tables placed on the same floor as the other tables, and the middlings are reconcentrated. Thus a very clean concentrate is obtained that assays 6.98 oz. per ton in gold, 881.57 oz. silver, 37 per cent. iron, 14 per cent. silica, one per cent. zinc, 33.7 per cent. sulphur, 0.5 per cent. copper, and 2.5 per cent. in arsenic and antimony, these two not being separated in the analysis. The middlings from these tables go to the elevators and are returned to the same tables to be retreated, while the tailings from these tables, which contain the most refractory parts of the ore, are fed by a Dorr classifier to another tube mill, 5 ft. in diameter and 18 ft. long, made by the Union Iron Works. Thus by choosing the most refractory material for the finest grinding the greatest benefit has been obtained from the fine grinding that is done. Both the Dorr classifier and the tube mill are put in a shallow pit so that the feed will flow to them without having to be reëlevated. These tails from the middlings tables, after being reground in the tube mill flow to the second tailings wheel which takes them to the separating cones.

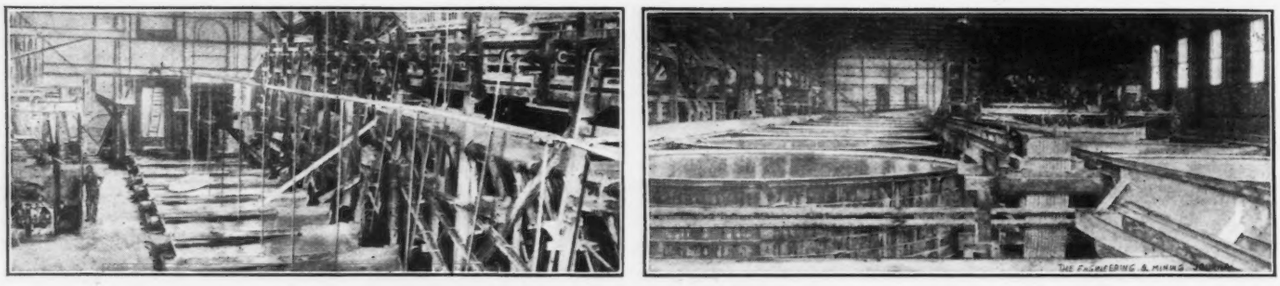
The concentrates from the tables are shoveled into a wheelbarrow and taken to a small vat with a filter bottom where they are pumped to 12 per cent. moisture, and then sacked. In these sacks the concentrates dry to about five per cent. moisture so that they can be shipped to the smeltery without being dried by fire. This cheap procedure is applicable, because the concentrates from the sulphide ores decompose less readily than those from the oxidized ores, and partly because of the small quantity of concentrates made. About 23 per cent. of the gold and silver in the ore is recovered by concentration. The saving on the tables could be greatly increased, were it desirable, but with present prices for smelting it is much cheaper to save as large a part of the gold and silver as possible by cyanidation.

On account of its size, the 5x18-ft. tube mill is the more efficient in its use of power and in its grinding than the 4x16-ft. mill. Both are equipped with spiral feed, and 4-in. silex lining is used, which is considered more economical than a cast-iron lining of the El Oro or Tonopah type, for there is no foundry nearby to provide cheap castings. It takes seven days to put in a silex lining, which lasts about eight months. The cost of lining the 4x16-ft. mill with 4-in. silex bricks is as follows: Labor, $192.43; cement, 23 sacks, at $1.23, $28.29; silex, 6600 bricks, at $33.50 per 1000, $221.10; total, $441.82.

Sand Treatment

The sand from the separating cones goes to one of the two collecting vats, 28 ft. in diameter and 7 ft. deep. The overflow from the collectors, which contains most of the slime that passes the cones, goes back to the same sand wheel that feeds the separating cones. Consequently, these separating cones are run so as to give an overflow practically free from sand, as about 97 per cent. of the overflow will pass a 200-mesh screen. Dependence is placed upon this second classification at the sand vats to provide a good leachable sand product. A Butters-Mein distributer is used for charging the collectors. The sand drains in the collectors from six to eight hours. Then it is transferred by a Blaisdell excavator and charger to one of the 12 treatment vats, 28 ft. in diameter by 7 ft. deep, which holds as charged 134 tons of sand. In the journey through the sand plant a charge is given three different leaches in as many treatment vats. An extraction of about 76 per cent. is made, as with a $27 ore the sand heads assay from $12 to $14 per ton, and the tailings $2.70 per ton. The sand is first leached with a solution, having a strength of from 6½ to 7 lb. KCN per ton. This strong solution, after precipitation, is added to the weaker solution used in washing the sand, thus supplying the deficit in cyanide that otherwise would occur during leaching. This strong leach lasts 30 hours, during which time the solution is circulated over the charge by an air lift to aërate it as well as to enrich it before precipitation. The leach is then continued, with a 5-lb. mill solution that has been precipitated, until six days have elapsed from the time leaching began.

After the first leach the charge is transferred twice, and in each vat the sand undergoes this same cycle of treatment for the six days, so that in all, the sand charge undergoes a leaching treatment lasting 18 days. At each transfer the cyanide that will be consumed by the charge during that leach is supplied by the strong solution wash that lasts for 30 hours. This loss is considerable, as in the three leaches it amounts to approximately 3.5 lb. per ton of dry sand treated. Lead acetate is added to the charge at each transfer; 20 lb. at the first, 10 lb. at the second and 5 lb. at the third. At the end of the last leach the sand is washed with 30 tons of water, which is about enough to displace the solution in the sand when it is discharged. The sand then drains 10 hours and is charged by a Blaisdell excavator to the belt conveyer. The strong solutions with which the sand is washed at each transfer for the first 30 hours, are precipitated, while the weaker solutions are also precipitated until they assay as low as the circulating-mill solution, or about $1.50 per ton. The



Leaching Plant and Wilfley Tables, Tonopah-Belmont Mill

leaching solutions are then added to the circulating solutions, and an equal quantity of circulating solution is precipitated in preference.

Dewatering the Slime

The slime that overflows from the separating cones goes to two thickeners of the Dorr type, the ploughs of which rotate once in 3½ minutes. The feed enters the thickeners through a central box that extends down into the vat, two-thirds of the way to the bottom, so that an absolutely clear overflow is obtained, although such would not appear to be the case at first glance at the vat, for a thick scum covers the surface of the solution. As the mill solution builds up in gold and silver content, a portion of the overflowing solution is drawn off at the thickeners and sent through the precipitation boxes. Thus the mill circulation is kept below $1.50 when the box heads are running $4 a ton in gold and silver, for it is the overflowing solution from the thickeners that makes up the bulk of the mill solution.

From the thickeners the pulp is transferred by a 3-in. air lift to the collecting vat at a specific gravity of about 1.20, corresponding to a thickness of about 72 per cent. moisture. Sometimes, when the mill is treating a larger amount of ore than usual, the density of the pulp is as high as 1.28, but this is avoided as much as possible, for the pulp shows a tendency to become viscuous, as there is a considerable amount of alumina in the ore. The best extraction is obtained when the density of the pulp is 1.20. The thickening system is self-regulating, as the speed with which the pulp is drawn off from the thickeners by the air lift, is controlled by the rate at which the pulp is drawn off from the collectors, while the speed of the air-lift operation is regulated by the amount of air fed to it. The thickeners, the collectors and also the agitators have a diameter of 28 ft. and are 20 ft. deep, so that they have a capacity of about 450 tons of pulp.

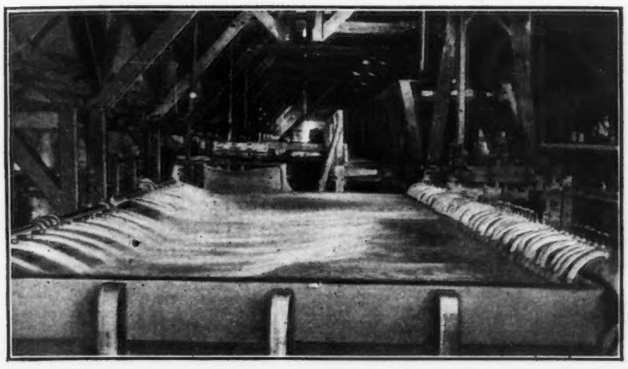
Half the cyanide required to bring the solution up to a strength of 5 lb. per ton, together with the necessary lead acetate, 0.6 lb. per ton of ore, is added when the collector is half full of pulp, and agitation begins at the collectors. At the collectors, during this agitation, lasting about eight hours, half of the gold and silver in the slime, which assays about $12.50 when it arrives at the thickeners, is removed.

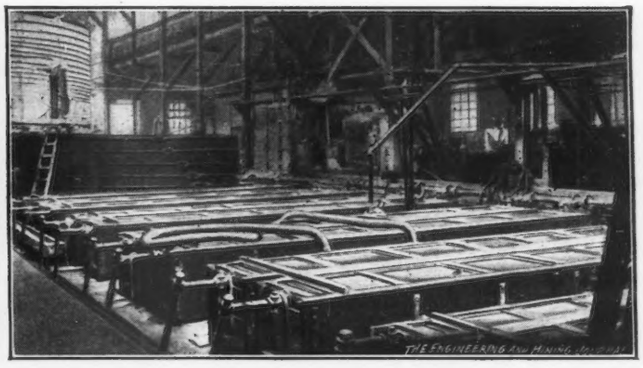
Slime Treatment

There are five agitators, all of the flat-bottom arm type prevalent a few years ago, but these have now been transformed and brought up to fair efficiency by adding an air jet. This air lift is on the outside of the vat, and there is only one for each agitator. The air lift consists of an outer pipe, 6 in. in diameter, inside of which is the ¾-in. pipe, through which the air is fed at a pressure of 15 lb. per sq. in. This air lift, which now gives the main agitation, as the arms are only depended upon to keep the heavier slime in suspension and to prevent the sandy slime from building up on the bottom of the vat, takes its feed from the vat at the center of the bottom and returns the pulp at the top near one side. By this means a good agitation and an effective aëration of the pulp is obtained. Steam coils keep the temperature of the solution in the agitators between 90 and 100 deg. Fahrenheit.

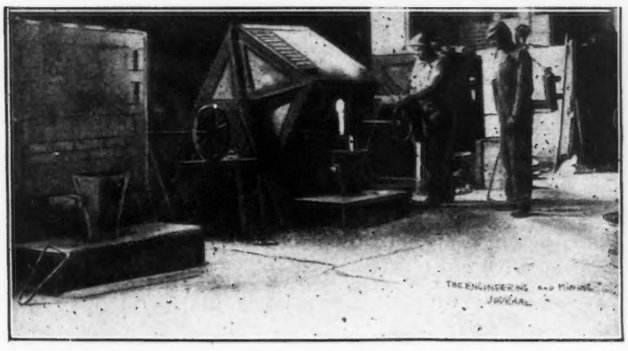
At the agitators sufficient cyanide is added to the pulp to bring the strength of the solution up to 5 lb. KCN per ton, and the pulp is given an agitation lasting 50 hours. But as the pulp is given a similar agitation in the collectors and also in the stock vat feeding the Butters filters, it is difficult to tell just what is the length of total agitation. From the agitators the pulp is transferred to the Butters stock vat by means of a six-in. centrifugal pump. Filtering is done by two Butters filters with 60 leaves each. The pulp is circulated in the filter vats by air lifts and fed back to the top of the vats through two header pipes with nipples attached to shoot the pulp out over the top of the vat. The filtering cycle takes 4 hr. 50 min., of which 1 hr. 15 min. is consumed in forming a 1⅛-in. cake and one hour in washing.

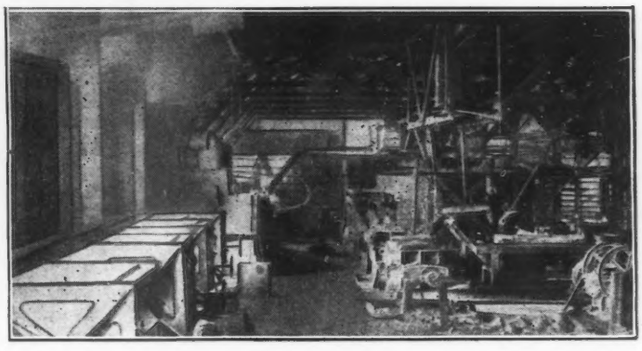
The company makes its own filter leaves, using a split header-board and 12-oz. canvas. No cocoa matting is put between the canvas, but instead wooden





Butters Filter and Precipitating Boxes





Refinery at Tonopah-Belmont Mill

strips about ½ in. square, set diagonally, are put in to keep the surfaces of the canvas apart. It costs $11.05 to build a complete filter leaf, while an old leaf can be re-covered with new canvas for $5.50. Consequently, as the filter leaves can be renovated so cheaply, the canvas is changed whenever it begins to show age by not clearing the solution thoroughly of slime. Thus, a clear solution is obtained from the filters; in fact, so clear that one can see to the bottom of the head-solution tank in the precipitation room, a depth of 7 ft., without difficulty. The reason for the great fight made to obtain especial clarity of the head solution going to the precipitation boxes is that otherwise a flocculent precipitate of aluminum hydrate is formed in the zinc boxes, and this coats the zinc shavings, giving much trouble and poor precipitation.

The tailings from the slime plant assay on an average about 0.0107 oz. gold and 2.003 oz. silver per ton as discharged and unwashed, giving them a monetary value, with silver reckoned at 52c. per oz., of $1.26 a ton. Consequently, in the slime plant an extraction of from 91 to 92 per cent. of the gold and silver is made calculating from slime heads to slime tails.

DIRECT MILLING AND CYANIDING COSTS, TONOPAH-BELMONT MILL

Cost per ton for last two fiscal years

		Crushing and Conveying	Stamping and Regrinding	Concentration	Elevating	Conveying and Discharging Sands	Leaching Sands	Agitating Slimes	Filtering and Discharging Slimes	Precipitation	Refining	Assaying	Motors and Lights	General Expenses: Watchman, Foreman and Storehouse	General Expenses: Wells and Water	General Expenses: Steam Heat	Total per Ton
Labor	1909	$0.066	$0.210	$0.120	$0.036	$0.078	$0.069	$0.090	$0.120	$0.069	$0.063	$0.063	$0.021	$0.111	$0.034	$0.074	$1.224
	1910	0.051	0.176	0.079	0.023	0.063	0.050	0.060	0.108	0.070	0.065	0.053	0.018	0.100	0.028	0.053	0.997
Supplies	1909	0.020	0.207	0.042	0.015	0.026	0.409	0.436	0.076	0.153	0.103	0.014	0.017	0.014	0.023	0.153	1.708
	1910	0.038	0.218	0.027	0.010	0.031	0.566	0.570	0.074	0.194	0.144	0.025	0.015	0.009	0.024	0.132	2.077
Power	1909	0.030	0.310	0.051	0.050	0.030	0.024	0.154	0.030	0.019	.....	.....	.....	.....	0.013	.....	0.711
	1910	0.028	0.348	0.038	0.037	0.015	0.018	0.104	0.023	0.011	.....	.....	.....	.....	0.011	.....	0.633
Total	1909	0.116	0.727	0.213	0.101	0.134	0.502	0.680	0.226	0.241	0.166	0.077	0.038	0.125	0.070	0.227	3.643
	1910	0.117	0.742	0.144	0.070	0.109	0.634	0.734	0.205	0.275	0.209	0.078	0.033	0.109	0.063	0.185	3.707

Precipitation and Refining

In the precipitation department there are 10 zinc boxes each having eight compartments 30x20x18 in. deep. About 1000 tons of solution are precipitated per day, of which 300 tons are overflow from the thickeners, while eight tons of solution per ton of sands treated, or about 300 tons a day, come from the leaching department, and about 400 tons of solution filtered from the slimes are precipitated each day. The head solution going to the boxes averages about $4 per ton in gold and silver, and the tail solution varies in assay from 5c. per ton just after a cleanup to 20c. per ton just before a cleanup, averaging about 15c per ton throughout a month. Four cleanups are made a month, and the precipitate is 700 fine in gold and silver. A complete analysis gave: Gold and silver, 65.57 per cent.; copper, 4.84 per cent.; zinc, 9.25 per cent.; lead, 5.04 per cent.; sulphur, 0.38 per cent.; calcium oxide, 3.6 per cent.; insoluble, 4.7 per cent.; water, 0.29 per cent.; and undetermined, 6.33 per cent.

The precipitate is dried in a muffle furnace with slack coke that cannot be used in the melting furnace, and the dried precipitate is charged into a graphite crucible and smelted in a Fabre-de Faur tilting furnace. The bullion is from 900 to 950 fine in silver, and from 9 to 12 fine in gold. About two tons of bullion are obtained at a cleanup. The slag from the smelting of the precipitate, after being crushed in a small jaw crusher and fine-ground in an Engelbaugh grinder, is concentrated in a jig so as to remove any shot metal. This concentrate is added to the next melt, while the tailings are settled and shipped to the smelter. None of the zinc shavings are cut down by acid, but instead the short zinc is returned to the boxes between layers of long zinc. The consumption of acid given in the statement of chemicals consumed per ton of ore milled is that used in cleaning the filter leaves of the coating that forms on them.

Four men work constantly either in the refinery or on the zinc boxes. It takes two days to make a cleanup, and a day and a half to melt and refine the precipitate, so that, as there are two tons of bullion made a cleanup, the refinery crew is working about 14 days of the month on the four cleanups. The rest of the time of these four men is taken up in crushing and regrinding the slag which amounts to about 10,000 lb. in a month.

Oil is used to fire the boilers which furnish the steam for heating the solutions at the agitators. This is where the main consumption of steam occurs. The heating of the solutions costs about 23c. per ton of ore treated, as the temperature of these solutions at the agitators is kept between 90 and 100 deg. F. But in the leaching department the temperature of the solutions is allowed to drop to about 70 deg. F. as it would cost too much to try to keep the temperature of these solutions higher. The heating of the solutions pays well, though, for an increase of 1 per cent. in extraction on the grade of head treated at this plant pays for the heating of the solutions, while it is known that there has been an increase in extraction, due to heating, amounting to about 3 per cent.

Oil is also used for firing the assay furnaces. This has effected considerable saving as with the oil delivered at the mill at 5.5c. per gal. the cost for fuel at the assay office is only 42c. per day, while when coal was used the cost, with coal at $20 a ton, was about $4.50 per day.

The whole mill is run, as far as actual labor of operating the machinery and running the plant is concerned, by a crew of 15 men, and one fireman tending boilers, on each of the three shifts, while there are four men working day shift in the refinery and precipitation department. As the mill is away from the mine the general-repair work, such as that done by electricians, men in the machine shop, etc., can not be shared with the mine, and the general crew at the mill is large. As a result, there is a complete crew of 45 men on the three shifts at the plant, including the superintendent.

A notable thing about the Belmont plant, which no doubt the reader has already noticed, is the large dependence placed on air lifts in handling the pulp, and this feature is also characteristic of the Desert mill of the Tonopah Mining Company. The reason for this is partly because of the continual fight that must be made against the reducers in the ore, but the main reason is that the air lifts are cheaper under the conditions at Millers, than are centrifugal pumps, as the extra cost of power that comes from the use of air lifts is more than made up for by the saving in cost of operation due to the small cost of upkeep and the extremely small amount of attention required by them in a district where the wages for mechanics are high, $5 per day of eight hours.

Liberal use is made of air about the plant. There are 7 six-inch air lifts and 14 three-inch air lifts. Twelve of the

three-inch air lifts are in use only part of the time, but the others are in practically continuous operation, yet the air is all supplied by an Ingersoll-Rand compressor having a capacity of 405 cu.ft. per min. at 15 lb. per sq.in. pressure.

The mill heads assay about $27 per ton, and about 220 tons of ore per day are milled. In November, 1910, 6500 tons were milled having an average grade of about $25 per ton in gold and silver. On these heads an extraction of 92.45 per cent. was made as the general tailings from the plant assayed $1.76 per ton. On the gold an extraction of 94.47 per cent was made, and on the silver 91.75 per cent. Of the total extraction 64.75 per cent. was made by cyanidation, and 27.48 per cent. by concentration.

The consumption of cyanide is 3.5 lb. per ton of ore treated, of lime 3.5 lb., of lead acetate 0.7 lb., of zinc 1.8 lb., of oil two gal., of hydrochloric acid (for cleaning filter leaves) 0.33 lb., of soda 0.3 lb., of borax 0.4 lb., and coke 2 lb. per ton of dry ore handled.

An accompanying table gives the cost of milling and cyaniding for the two fiscal years that ended March 1, 1911. In conclusion I wish to acknowledge my indebtedness to Frederick Bradshaw, manager of the Tonopah-Belmont company, for many kindnesses and the permission to go so fully into details concerning the operation of the plant; also to A. H. Jones, mill superintendent, and F. C. Reynolds, general foreman, for the information which enabled me to prepare this article.

Sintering Fine Iron Ore

By James Gayley*

The better saving of fine ore and flue dust a necessary economy. Successful experiments in sintering fine ore performed with the Dwight & Lloyd roaster.

*42 Broadway, New York.

NOTE—Abstract of a paper presented at the June meeting of the American Institute of Mining Engineers.

The waste of iron ore through the production of flue dust has increased enormously, largely through the increased use of Mesabi ores with their attendant fines. Attempts to recover the loss by recharging this flue dust into the furnace have been made, but naturally a material which has once been carried over is likely to be again. Attempts to give it cohesiveness by soaking it with water are of doubtful value.

However, the reclamation of this dust, of fine blue-billy, of magnetic concentrates, etc., by blast roasting seems to be a success. The machine used was the straight-line form of the Dwight & Lloyd roaster.[1]

PRESENT ROASTER TYPES

This type of machine is now made in two standard sizes, one having a suction-box 30x150 in. and a rated capacity of 50 tons per day; and the other with two suction boxes in tandem, having a width of 42 in. and an aggregate length of 264 in., and having a rated tonnage of 100 tons per day. The area of the suction box is the measure of the capacity of the machine, and the suction fan must be so proportioned as to maintain a vacuum of about 6 oz. when handling approximately 4000 cu.ft. of gases per min., this being the average volume from each 100-ton unit.

Such a fan, with short straight pipes, running at about 850 r.p.m., requires from 25 to 35 h.p. The sintering machine itself consumes about 1.5 h.p., but 10 h.p. is usually allowed for machine, conveyers, feeds and mixers—in fact, everything except the fan. Each sintering unit is self-contained and occupies space approximately as follows: 30x150-in. machine (50-ton unit): Length over all, 27 ft.; width, 7 ft.; hight of top of hopper above foundation, 11 ft., 4 in.; units in battery may be set with 11-ft. centers; weight of complete machine, approximately 16 tons. Forty-two by 264 in. machine (so called 100-ton unit): Length over all, 40 ft. 8 in.; width, 7 ft. 6 in.; hight of top of hopper above foundation, 13 ft. 9.5 in.; units in battery may be set with centers, 12 to 14 ft. apart; weight of complete machine, approximately 26 tons.

[1]ENG. AND MIN. JOURN., Aug. 13, 1910. *Bull.* A. I. M. E., Nov., 1910.

TREATMENT OF FERRUGINOUS MATERIAL

A number of iron-bearing materials, of different kinds, were treated on this machine, and in each case with satisfactory results. Among them were two shipments of iron flue dust, which were widely different as to physical condition. One was the usual character of flue dust, which I shall designate as No. 1, while the other, No. 2, was extremely fine, 50 per cent, of it passing through a 100-mesh sieve; but the sintered product of each was not distinguishable, and both were ideal in size and structure for the blast furnace. There were no large and compact masses like the product from the briquetting process, nor is the material rolled together in balls from the size of a pea to that of a cannon ball, as in the revolving kiln; but, instead, the individual pieces were cellular, like open pumice stone or porous cinder, which helps materially toward economic reduction in the furnace, as a large area of contact is provided between the ore and gases.

In Schinz' book[2], published in 1871, a chapter is devoted to area of contact. The opening sentence is as follows: "A chemical action can only take place between two bodies, however great their affinity, if they are in intimate contact with each other; and the rapidity of this action will be so much greater, the more numerous the points of contact are."

[2]"The Action of the Blast Frnace."

In the Dwight & Lloyd method of sintering with a bed of material that is not disturbed or agitated during the sintering operation, the sintered product is all so cellular that a large area of contact is provided; and compared with the more massive agglomerated products is as relatively reducible, as coke by reason of its cellular spaces, burns more readily than anthracite coal, which has only a superficial combustion. Although the product from the Dwight-Lloyd furnace in sintering flue dust is of a desirable size for blast-furnace use, yet a fair proportion of the product would be suitable for use in the open-hearth furnace.

SINTERING MATERIAL CONTAINING NO COMBUSTIBLE

In sintering materials which do not contain any heat-producing substances, recourse can be had to the practice of the ancient Catalan or Corsican process, where carbon fuel was mixed with the ore, and which, in its first stage, was an agglutinizing process. In order to test the machine on this class of work, some magnetic concentrates were treated, after being mixed with 7 per cent. of coal, and the product was found to be satisfactory in every particular. The material was sintered into a coherent mass, but so open and cellular in structure that the mass, in discharging from the pallets, broke into convenient sizes for the furnace, without any fines. As the mixture contained less carbon than the flue dust, it was sintered more quickly. While in the test on flue dust, a travel of 12 ft. in the grate movement was required to complete the sintering, the concentrates were completed in a travel of 6 ft. This represents, in the treatment of magnetic concentrates, a greatly increased capacity for the machine.

Some Cuban (Mayari) iron ore was also treated on the machine after being mixed with 7.5 per cent. of coal and coke in alternate tests, and afterward the ore was mixed with 10 per cent. of coal in

one test and 10 per cent. of coke in another; but the use of 10 per cent. of fuel did not show any advantage over 7.5 per cent., nor were the results from coke any better than from coal. The sintered product resembled closely that obtained from the flue dust; there was little fine material, and in fact, no fines that would require retreatment. The sintered material was irregular in shape, with an average size of a hickory nut.

The physical structure of the sintered product seems to depend on the size of material treated and the amount of volatile matter present. The Cuban ore being the finest, the sinter was of a smaller average size than the magnetic concentrates which were coarser and did not shrink so much in sintering. The flue dust being coarser than the Cuban ore produced a sinter about midway in size between that of the flue dust and the concentrates. The cohesiveness of the material is inversely as the amount of internal shrinking of the mass during sintering.

Advantages Observed

Among the advantages observed in the Dwight & Lloyd process, the following may be noted: (1) The feeding of material to, and discharge from the machine, without interfering with the continuity of the process. (2) The downdraft of air exerts pressure in the direction of the gravity of the mass, and prevents the displacement of particles. (3) The downdraft of air intensifies the combustion at the beginning of the sintering, and toward the end of it, operates efficiently to cool the mass. (4) The sintering operation is under constant observation during the whole period, and permits of rapid changes in adjustment. (5) The process can be stopped at any time to make any changes without interfering with or clogging any part of the apparatus. (6) The duration and activity of treatment are subject to ready control. (7) The adjustability of the process makes it adaptable to treating any class of fine material, without modifying the construction. (8) The withdrawing of the gases by a fan, provides a heating medium for drying ores carrying a surplus of moisture. (9) There is no nodulizing of the sintered material, and the cellular structure which is so important, is preserved. (10) The product is ideal in structure, for use in the blast-furnace, on account of the large area of contact provided, and its adaptability in size for distribution in, and passage through the furnace.

With the large productive capacity that has been built up in the iron and steel industry in the United States, matters of economy in production are now engaging the attention of the industry to a much greater extent than in the past. The most promising field for effecting economies therein, is in the manufacture of the pig iron; in which several avenues are still open for effecting great reductions in cost. An important field to operate in, is the prior treatment of the fine ores before being charged into the furnace. Twenty-five years ago the practice of charging large lumps of ore and stone, and large pieces of fuel was discontinued, and the crusher came into general use for reducing these materials to a more uniform size, with beneficial results in the furnace. The increasing use of the Mesabi ores, has led to the other extreme in practice, so that the fine ores, and the fine dust resulting from their use, require an agglomerating process, in order to return to the ideal condition of material as it was sized by the crusher.

Blast Furnace not Adapted to Fines

The use of fine ore in the blast furnace has not been successfully worked out, and probably never will be, and no time should be lost in adopting efficient and economical methods for treating these materials to make their use successful. The practice of recharging the flue dust as such is considered by many a questionable one. Some furnacemen hold the opinion that while the recharged flue dust is retained in part in the blast furnace, it is nevertheless detrimental, as it tends to collect on the bosh walls, and causes frequent slips and irregular working. Because so much ore is saved from the waste, it does not follow that it represents a saving in cost of pig iron. The screening of coke to eliminate the fine pieces is certainly beneficial, but it does not seem logical to recharge the same kind of material when intermixed with fine ore as in flue dust, into the furnace.

The actual amount of objectionable "fines" in the Mesabi ores, represents only a small percentage; but its pernicious influence is out of all proportion to the amount involved. At some furnaces in England, where the fine material is screened from the ores and sintered, beneficial results have been obtained. When the screening of the fine material from the coke was first advocated, it was objected to by many, as representing a waste of fuel, although of poorer quality, that might have some value in the furnace; but now the economic value of the practice is fully appreciated. The same practice applied to ores, and sintering the fine material to prevent waste, promises as great, or even greater benefits.

The Porphyry Coppers

By Percy E. Barbour*

While adding to some figures, already in my note book, those given in the Journal of May 27 for the tonnage and copper tenor of some of the Arizona porphyry mines, the idea of the accompanying table occurred to me. The figures almost speak for themselves. These 11 properties, containing all the so called porphyry coppers, have a tonnage, developed and partially developed, amounting to the stupendous total of 447,396,135 tons.

ESTIMATED OUTPUT OF THE PORPHYRY COPPER MINES

Mine	Tonnage Developed and Partially Developed	Copper Tenor, Per Cent.	Date of Estimate	Authority (f)	Total Copper Contents, Tons	Copper Recoverable at 70 Per Cent. Recovery Tons	Mill Capacity, Tons per Day
Utah Copper	203,500,000	1.67	1-1-11	5-6-11	3,398,450	2,378,915	(c)18,000
Ohio	13,000,000	1.75	.....	6-11-10	227,500	159,250	2,200
Nevada Consolidated	40,360,823	1.7	9-30-10	11-19-10	282,526	197,768	8,000
				2-11-11			
Giroux	9,620,000	1.9	.....	4- 8-11	182,780	127,946	(a) 1 000
Chino	45,238,312	2.3	5-1-11	5-20-11	1,040,481	728,337	(d) 3,000
Ray Consolidated	77,535,000	2.2	9-27-10	5- 6-11	1,705,770	1,194,039	8,000
Ray Central	6,440,000	2.15	.....	3-18-11	138,460	96,922	1,000
Miami	18,000,000	2.58	3-19-11	5-27-11	464,400	(b)325,080	(e)2,400
Inspiration	21,202,000	2.0	2-15-11	5-27-11	424,040	296,828	(a)2,400
New Keystone	3,500,000	2.36	6-1-10	5-27-11	82,600	57,820	(a)1,000
Live Oak	9,000,000	2.25	1-1-11	5-27-11	202,500	141,750	(a)1,000
Totals	447,396,135	1.82	.....	.....	8,149,507	5,704,655	48,000

(a) Assumed. (b) Miami is recovering 75 per cent. (c) Magna mill 10,000 and Arthur mill 8000 tons. (d) To be increased. (e) Foundations completed for three more sections, equivalent to 1200 tons. (f) As reported in Eng. and Min. Jour. of the respective dates.

In assuming a mill capacity for the properties at present without mills, either real or projected, I have assumed that if the Miami and Inspiration consolidate, as at present rumored, a mill of at least equal capacity to the Miami will be provided, probably as an extension to the latter. The 3000 tons of milling capacity alotted to the other three mines is as much as good judgment or current practice would justify. Therefore the total milling capacity of the porphyry coppers amounts to 48,000 tons per day. The average copper tenor of the total tonnage is 1.821 per cent., and the total copper metal contents is 8,149,507 tons.

During 1910 the Utah Copper Company recovered at the Magna plant 67.3 per cent. and at the Arthur plant 64.41 per cent. of the copper contained in the ores milled. The Nevada Consolidated for the same period made an average extraction of 69.5 per cent. At the Ray Consolidated mill, which is hardly tuned

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up yet, the results seem to indicate extractions fully up to expectation; viz., 70 per cent. The extraction at Miami is 75 per cent. Therefore it is conservative, but not ultra-conservative, to assume an average recovery, for the total tonnage, of 70 per cent. This gives 5,704,655 tons of copper recoverable from the total ore reserves as stated.

Dividing the total ore reserves by the total daily milling capacity of 48,000, and the results by 365 gives an apparent life to these porphyry mines, considered as a whole, of 25.5 years. Dividing the amount of copper recoverable by 25.5 gives an apparent average production per year of 223,711 tons of copper, equivalent to 447,422,000 lb. per annum.

None of this copper is coming to the market at present, except that of the Utah Copper, Ohio and Nevada Consolidated. Of the 18,000 tons, the Utah's total daily milling capacity, 7000 is new capacity due to improvements in machinery and method so that these three have 21,000 tons of the total 48,000 tons total milling capacity which may be called old. This leaves 27,000 tons milling capacity which is new, the product from which is not yet in the market nor will some of it be for a year, or two or three. But by applying this new increase of 27/48 of the total copper recoverable over the period calculated to be the life of the mines, 25.5 years, gives an annual production from these new sources of 251,674,875 lb. of copper. The total copper derived from ores produced in the United States alone in 1909 was 1,105,336,326 lb. and in 1910 was 1,086,151,430 lb.[1] This shows a decrease for 1910 of 19,184,896 lb. but the normal difference between any two years is an increase of about 10 per cent.

As to the relation between this normal increase and the 251,674,875 lb. per annum from the new porphyry sources I am not going to speculate here. It reminds me of a long letter on copper statistics which I wrote in 1906 to show that the metal, which was then booming around 17c., was much too high and that there was no need nor justification for its selling at such a price. Of course, copper shares were boiling at that time. One very keen man "on the street" with whom I discussed the figures, said "Well, those figures seem to be all right, but the man who goes short of this market on statistics will lose money." And copper went to 27c. Two years afterward it was plain to everyone that the situation was entirely uncalled for, but being two years too soon was just as bad as being two years too late.

[While Mr. Barbour has carefully stated the authority of his respective estimates, he has not in all cases been discriminative as to the authority, which lays him open to criticism in some particulars. Thus, we do not believe that the ore developed by the Ohio Copper Company averages so high as 1.75 per cent. copper. The Giroux data are doubtful and must be questioned until the officers of that company have made a revised statement. While the Nevada Consolidated possessed originally a development of about 40,000,000 tons of ore, a considerable part of it has already been extracted. Most important is the estimate for the Utah Copper Company, which, although made officially, is not yet generally accepted without reservation. Mr. Barbour has not included the Braden mine, which, although of South America, will figure commercially with the North American producers.—EDITOR].

[1]ENG. AND MIN. JOURN., Jan. 7, 1911.

Metallurgical Laboratory at Oklahoma School of Mines

The contract for the ore-dressing and transmission machinery for the metallurgical laboratory of the Oklahoma School of Mines and Metallurgy, at Wilburton, has recently been awarded to the Allis-Chalmers Company, and indicates a complete equipment.

The crushing plant includes Blake, Dodge and Gates types of crushers, and the roll-crushing section consists of a feeder and two sets of rolls. The sampling plant is to be equipped with a Bridgeman automatic sampler and a sample grinder. In the fine-grinding department are a tube mill, steam drying pans and ore-bin fixtures, and the elevating and screening section includes three elevators and a set of three screens with feeders. The concentrating section is especially complete, and consists of one 5-compartment, one 3-compartment, and one 2-compartment jig, one 2-spigot Richards hindered settling classifier, a Callow pulp-thickening tank, two small-size concentrating tables and a Frue vanner, together with necessary pumps. The stamp section consists of five 500-lb. gravity stamps, feeder and gate, copper plates, amalgam trap and pumps. In the Huntington-mill plant there will be a 3½-ft. Huntington mill, feeder and gate, copper plates and amalgam trap. The amalgamating section includes a 30-in. amalgamating pan, dewatering cone, cleanup pans and pumps. The chlorination plant consists of precipitating, storage and settling tanks, lead-lined chlorination barrel and fixtures.

The cyanide plant includes solution tanks, leaching tanks, one of which is equipped with a mechanical agitator, gold tanks, sump tanks, filter boxes, pump and fixtures. In the magnetic-separating department there is to be a Dings magnetic separator, with accessory equipment. The installation complete will cost about $25,000. In the assaying department, the Denver Fire Clay Company will furnish a modern equipment of furnaces of various types.

Origin of Hydrocarbons

No problem in geology appears more complex than that of the origin of the numerous natural hydrocarbons—asphalt, ozokerite, petroleum and natural gas. In fact, geologists are at variance in their theories as to the manner in which these are produced. A great number of the more important hydrocarbons found in petroleums can be produced artificially from organic substances, such as coal, wood and fish oil, while identical or closely allied hydrocarbons result from the interaction of inorganic substances, such as cast iron and hydrochloric acid. In many places petroleum is closely associated with fossiliferous strata; but hydrocarbons exist also in meteorites and in volcanic gases and they are even obtainable from some igneous rocks.

Some oils are undoubtedly organic and some are beyond question inorganic. They may have been derived from carbonaceous matter of vegetable or animal origin, and they may have been derived from carbides of iron and other metals. It is also barely possible that the hydrocarbons exist as such in the mass of earth.

While studying the subject[1], George F. Becker was led to inquire whether any relation could be detected between the behavior of the compass needle and the distribution of hydrocarbons. Not much could be expected from a comparison of these phenomena, for magnetite exerts an attraction on the needle whether this mineral occurs in masses or disseminated in massive rocks; moreover, many volcanic rocks possess polarity. In glancing over a map of the magnetic declination in the United States, Mr. Becker found that the irregularities of the curves of equal declination of the compass were strongly marked in the principal oil regions. The most marked agreement is found through the great Appalachian oilfield, which is the area of greatest variation and declination. In California, also, strong deflections accompany the chain of hydrocarbon deposits.

These observations are to some extent also supported by conditions in the Caucasus, where great magnetic disturbances exist. While the theory of the inorganic origin of the hydrocarbons is not proved by this study, yet the contention that great oil deposits are generated from iron carbides is strongly borne out by a study of the map of magnetic disturbances in the United States. The map shows that petroleum is intimately associated with magnetic disturbances similar to those arising from the neighborhood of substances possessing sensible magnetic properties, such as iron, nickel, cobalt and magnetite.

[1]*Bull.* 401, U. S. Geological Survey, "Relations between Local Magnetic Disturbances and the Genesis of Petroleum," by George F. Becker.

Caballo Mountain Vanadium Mines

By Paul A. Larsh *

Promising deposits of vanadium ores in New Mexico, but the metallurgy is still in the experimental state. Complex ores contain lead, copper, molybdenum and vanadium.

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The Caballo or Horse mountains of New Mexico comprise a small range lying about the center of Sierra county. The north end begins just south of Elephant butte, the site of the Government or Eagle dam, and extends about 20 miles south. They are bounded on the west by the Rio Grande and on the east by the Jornada del Muerto plains. The foot hills proper on the east are composed of Cretaceous sand, shales and some small coal seams, of poor grade.

The next higher in altitude and lower geologically comes the red beds of the Carboniferous, in which is the beginning of the mineral-bearing veins. The fissures here are mostly filled with barren quartz, with occasional bunches, pockets or seams of copper ores. The main mountains above are composed almost wholly of Carboniferous limestone and shales, the former predominating and having a thickness of about 1200 ft.

About seven miles from the north end of the range the mountains are cut by Palomas pass, separating them into North and South Caballos, and within a distance of two miles on each side of this pass both on the east and west slopes the principal veins are found. The lead-bearing minerals are on the east and the copper on the west. On the east side directly opposite, and to the north of this pass are found the vanadium-bearing veins. A peculiar condition of deposits exists here. Directly opposite the pass the veins carry both vanadates and molybdates of lead. To the north the veins carry the vanadates with little or no molybdates, and to the south the veins contain the molybdates without the vanadates. Beginning at the south end of the district the veins have a course of 20 to 25 deg. north of west, at the north end of the district they trend southwest.

The Veins

The primary vein-filling material consists of galena imbedded in fluorite, barite and quartz gangue. The oreshoots range from 25 to 200 ft. in thickness and from seams to 20 ft. in width between walls. The best example of the veins to the south of the district where only galenite is present, is that of the Rosa Lee mine. Here the vein outcrops about 800 or 900 ft. This mine has a tunnel driven on the vein some 600 ft., and the oreshoot with the exception of a few feet from the mouth of the tunnel, lies entirely above. A 60-ft. shaft is driven through the shoot at the lowest point east on the claim, and a 100-ft. shaft cuts through the shoot at the highest point to the west. The distance between these shafts is 1000 ft. The upper shaft is driven in a large body or blow out of quartz, carrying 3 or 4 per cent. of galenite.

The veins to the south of the Rosa Lee show no indication whatever of vanadinites, molybdates or other secondary minerals. In the Rosa Lee blow out there is a small shoot of oxidized material showing some molybdenum but only on the surface, and no vanadium. The next parallel vein lying to the north 15,000 ft., is the Napoleon, similar to the Rosa Lee but not so extensively explored. In addition to the primary ores this mine shows in a limited portion of the shoot, a leached material from 1 to 2 ft. thick, consisting of a honey-combed quartz, carrying considerable galena rounded into pebble-shaped forms by the action of the solutions, together with yellow cubes of lead molybdate cemented to the quartz shells and to the outside of the galena pebbles. This mine does not show any vanadium.

The Red Top Mine

The next deposit of importance is that of the Red Top mine and extensions, opposite to Palomas pass, lying about three-fourths of a mile north of the mines mentioned. This vein promises to be the largest producer in the camp. Although the development here is not so extensive as the Swan and Dewey mines farther north, the ore outcrops a distance of about 1500 ft. on the surface, as compared to 100 and 150 ft. outcrop on the Dewey and Swan mines. On the extension claims of the Red Top the top of the shoot is reached by shafts at 60 to 100 ft. These shafts are about the center of this group and from them has been shipped several cars of crude ore assaying from 2 to 4 per cent. vanadium. At the bottom of the Red Top shaft where they are just beginning to get into the oreshoot proper, caverns and water courses are encountered, lined with vanadium ores. In the vicinity of these water courses the soft "sand carbonates" of the miners, which consists of needle crystals of vanadinite and calcite are found in large bodies 15 to 20 ft. thick. All of these orebodies dip rapidly to the east, and the east extensions have proved to be the most valuable mining claims, although showing little on the surface.

What was supposed to be the biggest deposit in the camp until recently was that of the White Swan mine owned by the Vanadium Mines Company, of Pittsburg, Penn. Development however, has shown that this shoot is passing rapidly on its dip into the Benjamin claim, the east extension of the Swan. The discovery shaft on the Swan is only 600 ft. from the east-end line and this shaft passes through the first shoot at about the 100-ft. level. This shoot is dipping into the Benjamin claim at the rate of 150 ft. to 100 ft. in depth. The Dewey shoot lying 900 ft. to the north is similar and about of the same value.

The vanadium-ore gangue is composed in the greater part, of calcite, barite, fluorite and quartz, as a soft spongy mass in which the crystals of vanadinite are mingled. The finer crystals of vanadinite are of gold-yellow color, the larger ones a dark reddish brown, needle-shaped hexagonal and often hollow centered. Beautiful specimens may be had showing masses of large brown crystals in quartz. The most beautiful ones, however, come from the lower levels where the crystals are held together by a clear almost colorless calcite. These specimens are so frail that they rarely survive transportation to the top of the mine. Other vanadium minerals and some pyromorphite and cerussite are present.

As has been noted the ores are confined to certain lime strata, and only deposited in these where there are evidences of water courses. The White Swan and Dewey mines will probably produce 20,000 tons of 1 per cent. vanadium ores carrying about 4 per cent. lead. The really large production of the camp will be from the Benjamin or Swan extension and the extension claims of the Red Top mine.

The Metallurgy

The cart has been put before the horse in the building of reduction and oxide plants for the treatment of concentrates before the orebodies were developed and the results of concentration known. The Vanadium Mines Company is experimenting with a small mill that was originally constructed for the concentration of the galena ores, but the results from this mill have not been satisfactory. Experiments have shown that with proper equipment from 75 to 80 per cent. saving can be made with the production of a high-grade concentrate, and an additional saving by taking out a lower-grade middling product. Leaching of the concentrates with sulphuric acid is not practicable unless the concentrates are high grade. Owing to the basic qualities of the gangue ordinary smelting is not permissible, but experiments are being made with a special process of smelting.

The Use of Sectionalized Machinery

By T. Lane Carter *

Sectionalized machinery will always be required in out-of-the-way places. Essential that each piece weigh under 300 lb. and that sections be well milled to avoid leaks.

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To the engineer whose work is in the pleasant places of the world, where railroads run close to mines, the problem of transporting machinery seems simple. All that is necessary is to load the machinery on cars at the factory and unload it when the train reaches the mine. But if the engineer ever goes to countries where civilization is new and where all supplies must be dragged over mountains or through swamps, he will see the importance of sectionalized machinery. There are many mines in out-of-the-way places of the world, earning large profits every year, which could never have come into existence had it not been for sectionalized machinery.

Transportation Difficulties

The engineer who has groaned over the difficulties of transportation in Mexico and Central America, should go to some parts of Central Africa if he wants to find harder problems. There it is impossible to use oxen or mules in the tracts where the tsetse fly abounds, for the bite of this insect is fatal to all domestic animals. The only way to get machinery to the mines or prospects, is to send it on the heads of natives. Now that the railroads are penetrating Central Africa, conditions are improving. I remember some years ago seeing a string of natives carrying or dragging pieces of machinery from the Victoria falls to some copper prospects to the north.

When it is remembered that these natives travel through a wilderness where no food can be procured save an occasional wild beast, the reader will appreciate the difficulties and expense of transportation of machinery and the food for the carriers. The average weight for an individual carrier runs from 35 to 40 lb. The heavy pieces were dragged on the ground by a number of natives. Fortunately for mining on the American continents, it is possible to use pack animals to carry the machinery. We have no tsetse flies.

Factors to be Considered

No one will use sectionalized machinery if he can avoid it, for it frequently gives a great deal of trouble. I once saw a sectionalized 10-stamp mill erected in the wilds of Central America, which leaked so badly that nearly as much of the crushed material went through the machinery as was splashed through the screens. The engineer is frequently faced with this problem: In a new district, let us say in Mexico, it is possible to get machinery to a mine if enough money is spent to transport it. By specifying sectionalized machinery, he will be able to save a great deal on the freight. His problem is to decide whether it is better to spend an extra amount on freight and get the heavy machinery, or to save on the freight by bringing in sectionalized machinery. If it is possible to get in the heavy machinery and if he is backed by ample capital, the engineer generally decides in favor of the heavy machinery.

If the conditions are such that sectionalized machinery must be used, there are a number of things of which the engineer must be careful. In the first place, he must be sure that each piece is sent to him from the manufacturer, weighing not more than the specified amount, viz., about 300 lb. If the manufacturer finds it necessary to send out pieces weighing more than this, the engineer should be advised so that he can make preparations. It sometimes becomes necessary to specify the size of the sections. For instance, in some of the mountains in Spanish America the trails are so narrow that if pieces of ordinary boiler plate are sent out they will be too wide to be carried on the backs of the mules along the narrow paths.

Facing Sectionalized Parts

It is, of course, most important that the "milling" of the machinery by the manufacturer be done with especial care. If the surfaces are not planed smooth there will be bad fits and a consequent leaking of the crushed material. A good scheme is to "rust" the pieces together by using a mixture of sulphur and sal ammoniac. If this is done carefully the pieces can be made tight.

In some parts of the world where transportation by means of pack animals is common, the carrying of sectionalized machinery from the railroad terminus to the mine can be done by contract, but in many sections it is necessary for the engineer to furnish his own equipment. In Mexico, for instance, it is always preferable to give a contract for the carrying of machinery. The natives have been doing this work for generations so that now it seems like second nature to them. It is remarkable how cheaply they are able to carry freight. In a mountainous section of Mexico with which I am acquainted, the contractors carry freight for a distance of 45 miles over a dangerous trail for less than 1c. per lb. Under like conditions I do not know of a place in the world where machinery could be handled as cheaply as this. In Central America the cost would be much higher, probably double. In this section of Mexico the competition is keen, which accounts for the low price.

Roads and Water Ways Important

One of the biggest mistakes made in most parts of the world where sectional machinery is handled, is that not enough attention is paid to the roads or water ways by which the machinery must be brought in. It pays to spend money to get the roads in good condition before trying to bring freight in. This remark applies with equal force to rivers, where it is possible to bring freight in small canoes. Sometimes one sees an animal, loaded with freight, roll down the side of a mountain from a tortuous path, all because insufficient attention had been given to the trail. Not only would the animal be killed but there would be a long delay in dragging the freight back to the path. In Central America one frequently sees streams up which tons of freight are being paddled, where occasional rapids add to the expense and danger of the handling of freight. By spending a few thousand dollars blasting out rocks in the rivers, the canoes could ascend the streams far more quickly. Cargoes of machinery are sometimes lost in these rapids because money has not been spent in preparing a safe channel.

The question of pack animals is most important. In Mexico mules and burros are principally used, whereas in Central America one sees a great number of oxen carrying freight on their backs. The ox, however, is not a good pack animal. His back seems to get sore and it takes a long time to cure the wounds. Where it is possible to drag the freight the ox is a satisfactory animal. One does not see many horses used by contractors. The work is so trying that as a rule a horse cannot stand it. It is remarkable how well the mules will endure the hardships of the trail. His little brother, the burro, also does well for his size.

It would not be well for an enthusiastic member of the Society for the Prevention of Cruelty to Animals to travel through the out-of-the-way places in Mexico. There one sees mules so loaded down that they stagger under the weight. To the inexperienced it would appear that the animal must totter beneath his load but the drivers seem to know almost to the pound what the animal can stand. They never seem to add the proverbial straw to break the camel's back.

By using a large number of mules the contractors are able to handle freight at the low rate which prevails. The mules are so well trained that one man, or peon, can take charge of a large number. There are small settlements along the routes where it is possible to buy food for the animals and for the men. In this regard Mexico has a big advantage over Central America, where the populace in many sections is so sparse that food must be carried for animals and men alike.

Sometimes it is almost impossible to get pieces of machinery weighing 300 lb. or under. When one piece of machinery weighs from 700 to 800 lb., the question arises whether it is better to employ men to drag the freight over the trail or to try to carry it with two mules. No matter what method is employed it is always more expensive to handle the heavy machinery. The cost per pound for moving weights of 700 to 800 lb. can readily be twice the amount paid for the ordinary mule load.

The character of the roads or trails has a good deal to do with the method of transportation of freight. In countries like Central America where the rainfall is excessive and the trails in the wet season are sloughs of despond, it generally pays to drag the machinery on sleighs rather than carry it on the backs of the mules or oxen. In Mexico where the rainfall is not so heavy the trails are far better than in Central America, so that it is preferable to carry freight on the backs of the animals.

In the tropics it is cheaper to freight on the rivers than on the land. Every effort is made to get the machinery up streams which flow close to the mines. The cost of freighting is determined by the distance of the mines from the warehouse. For instance, the transportation charges on sectionalized machinery from New Orleans to a small town in Nicaragua on a river 18 miles from the mine amounts to 2½c. per lb. To carry this freight from this town over a typical Nicaraguan trail to the mines in the mountains, costs 4 to 4½c. per lb., or $80 to $90 per ton. This example shows the importance of bringing the machinery by water as close to the mines as possible. In Central America the streams are so numerous that greater advantage can be taken of water transportation than in Mexico.

Steel Tanks Generally Preferable

A problem that faces the engineer frequently in a wooded country like Central America, is whether it is preferable to bring in sectionalized steel tanks for cyanide plants or to make the tanks of native wood. A good deal depends upon conditions. If the mine is surrounded by timber and it is practical to build a small sawmill to make lumber, it pays to build the tanks of wood. If, however, all the timber has been cleared away for miles around and a sawmill is impracticable, it is better to import the tanks for a cyanide plant in sections. If your tanks are made of hand-sawed timber, this is quite expensive. I know of cases where wooden tanks were imported from the United States and carried in canoes and on the backs of animals to the new mine in the wilderness. The staves were so thoroughly soaked in water that when they were placed on the back of the animals the weight was nearly double what it was when they were dry. In a case like this it would have been better to bring in the tanks in sectionalized steel sheets. The original cost might have been a little more but the freight would not have amounted to much more, and when the tanks were put up all danger from destructive insects would have been past. I have come to the conclusion that in the tropics unless lumber can be cheaply procured, it is best to bring in steel tanks when erecting a cyanide plant. The same argument applies to steel precipitation boxes.

Gold and silver have one great advantages over all other kinds of mining in an out-of-the-way place, viz., that when the machinery is once erected the amount of freight needed is small. There are a number of mines of copper, lead, etc., in inaccessible places which are unpayable today on account of the distance from a river. The problem of how to make these remote base-metal mines pay has exercised the minds of engineers for years past.

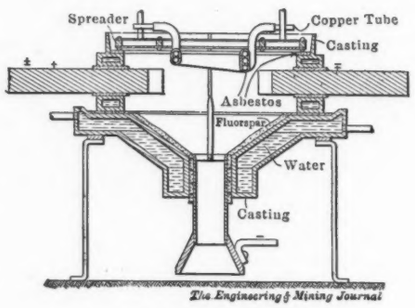
Sectional Machines Will Long be Required

This question of sectionalized machinery is important. No matter how far railroad development is carried, there are some parts of the world to which it will be impracticable to ever take a railroad. A good example of this is the mountainous region of Western Mexico. While the Southern Pacific will undoubtedly finish the line connecting the city of Tepic with Mexico City, there will always be mines in the mountains to which it will be impossible to build a railroad. These mines must depend for their success on sectionalized machinery. Gold-mining sectionalized machinery has now been evolved to a fairly satisfactory state. One may mention the one-stamp mortar boxes which are doing good work in many parts of the world.

In this day of railroad transportation one looks upon the work of the past, before sectionalized machinery was invented, with unbounded admiration. In Mexico the early workers frequently dragged their machinery over the mountains for scores of miles, feats as great as Napoleon's spectacular success in carrying the cannons over the Alps. In one case in an old mine in Western Mexico it was necessary to drag the machinery from the City of Mexico to the mine a distance of hundreds of miles. After the machinery was erected the mine paid enormous sums, but this was in the days when silver was worth 129c. per oz. and not 53c., as at present.

Calcium

Calcium is a metal of limited production at present, though there is no doubt that there will be an awakening of interest in the metal when its properties are better known. As a refining and reducing agent, either alone or in combination with magnesium, or with magnesium and silicon, it seems destined to an increased production. The price at present is around $1.50 per lb., but this could be readily reduced to about 45c. per lb., were the market sufficient to justify manufacturing it in large quantities. The production in the United States in 1910 did not exceed 50 lb., all of which was



Calcium Furnace

manufactured by the Virginia Electrolytic Company, at Holcomb's Rock, Va., in a furnace of the type illustrated herewith.

Pertitanic Acid in Iron Analysis

A possible source of error in iron analysis is that due to pertitanic acid. The ordinary soda or soda-potash fusion decomposes refractory titaniferous minerals slowly, so that a hydroxide fusion is often resorted to. After dissolving the melt, the solution shows an orange color, due to pertitanic acid. The amount of this acid is highest if nickel crucibles are used for the fusion, and practically nothing with silver. The pertitanic acid can be eliminated by strongly acidulating the solution with sulphuric acid, and then running in permanganate solution until a pink color appears. The removal of the pertitanates is by no means a superfluous precaution, as comparatively large amounts are often formed (*Journ.* Soc. Chem. Ind., April 15, 1911). Thus an ore carrying 39.2 per cent. TiO_2, gave 2.2 pertitanic acid, after a 7-min. hydroxide fusion, and a sample of rutile gave 14.52 pertitanic acid after 20 minutes.

A Journey across South America—II

By F. Glaizot*

Detailed information concerning the mines and reduction works of Bolivia. Insufficient labor supply, scanty water and fuel and high altitudes combine to make work difficult.

*Industrial engineer, Paris, France.

NOTE—Translated by Mark R. Lamb from *Bull.* Soc. de l'Ind. Min., July, 1910.

Traveling over the districts of La Paz and Oruro from north to south, one first comes to Huayni-Potosí. This deposit is on one of the spurs of Mount Kaka-Aca, at an altitude of about 16,000 ft. There are no occurrences of tin ore in true fissure veins. According to M. Tréloar, the origin of the ore is connected with a quartz-porphyry dike and the ore is spread between the schist beds, which have themselves been influenced by the contact phenomena. The ore beds, after forming a large pocket at the Carmen-Aurora mine, where they form a compact bunch, again subdivide into veinlets, which decrease in width as they extend southward. Nevertheless, sometimes these ramifications form payable deposits. This ore deposit is peculiar in that it also contains bismuth. A second mineralization deposited the bismuth in the metallic form and as bismuthine, these being sometimes covered with a little oxide of bismuth. The deposit is irregular, the ore being spread out between the strata without being guided by anything but the greater or less elasticity of the country rock. The pockets of ore, usually strong at the cropping, become narrower with depth. The cassiterite is sometimes deposited in compact beds or *guias*, which may reach 2 in. in thickness. More frequently it occurs as an impregnation of the decomposed eruptive, and sometimes it extends as far as to the adjoining schists. True fissure veins of tin ore occur north of this deposit, but their values are insufficient to warrant development. To the southward are many silver-ore veins which cut the tin-ore beds. These veins constitute the ancient silver mines of Huayna-Potosí (or New Potosí). They have long been abandoned on account of the increased cost of labor since the war of independence.

MILLUNI

The Milluni hills are spurs of the mountain Antajahua, which connects with the Cordillera Real at the Charquini pass and the Cunu-Jitita glacier. The Antajahua peak is 19,000 ft. high. It is composed of quartzite and schist strata. In the distance of six miles a number of important fissure veins occur, which are parallel and extend in the north-northwest direction. These tin veins are cut perpendicularly by others and the meeting of these two series of veins has given rise to faults (*sic*). The Milluni, Churiunani, Ventanani, Chacaltaya and Kaluyo mines are on this deposit. These different mines are frequently on the same veins and development commences in the different valleys, resulting sometimes in a meeting in the interior of the mountain, from which comes interminable trespass suits. The veins are of quartz impregnated with cassiterite sometimes associated with pyrite. The walls are practically vertical.

The Milluni and the Churiunani mines are on the richest of these veins. The concentration produced by the surface water filtering through the veins has frequently given rise to zones of enrichment, as occurs in the veins of Salvador.

THE CONCEPCION MINE

The Concepcion is a remarkable vein, the outcrop of which can be followed for more than a mile, with an average width of 25 ft. The foot-wall is covered with calcite mixed with blende and sometimes with galena, then comes a deposit of fine-grained cassiterite with stanniferous pyrite, the last decreasing in tin content as the hanging-wall is approached. The ore is mined through adits. The Ventanani mine is higher than the several above mentioned mines, reaching an altitude of 17,000 to 19,000 ft. under perpetual snow. The mineralization is the same and little development has been done.

The Chacaltaya and the Kaluyo mines are at the southern end of the deposit. Important development work has been done. The outcrops alone have been uncovered for a long distance and show oxidized ore containing more than 10 per cent. of tin. But those drifts which have exposed the ore at depth show an increasing quantity of pyrite with a decreasing proportion of tin. The veins at this point seem to have resisted the action of the surface water, the walls consisting of excessively hard and compact quartzite.

Araca is on the west side of the cordillera at the point where the La Paz river cuts through the range. It is too far from Quimza-Cruz to be considered a part of that important deposit, as will be seen later. The tin veins produce a large amount of oxidized ore, the only class mined. Notwithstanding the great distance (60 miles) from any railway, and the bad condition of the routes of travel, including innumerable fords across the La Paz river, this mine is prosperous and is making a good production. The cassiterite occurs in large crystals, the most beautiful which I have seen in Bolivia. It sometimes occurs in beds 8 in. thick, extending over a considerable area. The zone of oxidization seems to have extended to a great depth. The tin is frequently associated with wolfram, which interferes with concentration.

The eminence of Quimza-Cruz is a part of the Cordillera Real. The highest point is the Santa Vera Cruz peak, which is over 20,000 ft. high. The tin deposit consists of a number of veins, which often extend to the perpetual snow line. Many of the beds being worked are above 16,000 ft. Wolfram is sometimes found, as at Araca, associated with tin. Five years ago there was a great excitement at Quimza-Cruz. An outcrop of extraordinary richness was discovered, and various companies were formed, based on indefinite data, and before any prospecting work had been done. Unfortunately, their expectations, in many cases, were not realized. The most important company formed under these conditions was the Monte-Blanco, the shares of which promptly fell to one-tenth of their original value.

Conversely, some of the foreign companies, notably the one which developed the Concordia mine, prospected carefully for a number of years in order to be certain of a considerable quantity of ore in sight. The Concordia is one of the best prospected mines in Bolivia. The search for tin at other points on the deposit had been carried on actively. But, although it is true that the vein formation (between schist and quartzite) resembles very much the deposits previously described, it does not seem to have as fair a future insofar as concerns tonnage and metal contents. Moreover, the rigorous climate and the distances from railways are great obstacles to the prosperity of these enterprises.

COLQUIRI

The deposit of Colquiri, formerly worked by the Spaniards for silver, is situated south of Quimza-Cruz and 40 miles north of Oruro. It is, like the others described above, composed of fissure veins in stratified schists. There is a strong main vein, 45 ft. wide in places, cropping for a distance of three miles. Its strike is north-northeast. It is a complex vein containing cassiterite and chloride of silver, with pyrites of which some are arsenical, together with slightly argentiferous galena and sometimes blende. This vein, with its ramifications forms the basis of many mining properties which are worked for tin, but

only on a small scale. Besides these principal veins there are others which are practically parallel, upon which is the Ocavi mine. This mine recently has been taken over by the De La Paz Mining Company, which has done considerable development work and has built a concentrator. Much float is constantly in evidence, especially from the Thalia and the Copacabana tin veins and the Spanish lode, a silver vein. The cassiterite occurs in beds against one of the walls in contact with the metamorphosed clay, mixed with small grains of quartz which, in these veins, has become extremely hard, and is known as *panizo*. On one side of the tin streak is some pyrite and next is the clay impregnated with iron oxide. These veins are about 6 ft. wide and are explored to a depth of 270 ft. Nothing is yet mined but the oxidized ore. The Colquiri deposit is on the line of separation of the water sheds of the cordillera, which is low at that point. Its altitude is 13,500 ft., and it is connected to Eucalyptus station, near Oruro, by a cart road about 45 miles long.

Oruro

The deposit of Oruro is on the side of San Pedro mountain which is an intrusion of rhyolite which rises like an island on the high Bolivian plateau, above which it stands about 1300 feet. This mass is cut by numerous fractures which have given place to tin and silver veins. It is one of the anciently worked deposits of Bolivia. The Incas extracted silver from it. The workings, suspended at the time of the Spanish invasion, were again started long afterward by the conquerors who worked the Atoche and the Tetilla mines. But they were content to mine only the chloride of silver and they ignored the sulphide. The revolt of the Indians at the end of the eighteenth century interrupted the work which was not started again until 1845 under the initiative of a Frenchman, de la Rivette, who explored and prospected the San José and the Tetilla mines. Little by little work was begun again on the Colorada, Socavon de la Virgen and Itos mines. A French company started up the Tetilla mine in 1890. Meantime the town of Oruro had been founded and had developed to a point where, considering its position at the center of the high plateau, the question of making it the capital of Bolivia was seriously considered. But its cold climate and the aridity of its soil, both due to its constant exposure to the wind, rendered such a project untenable.

The veins of Oruro have a quartz gangue mixed sometimes with barite and gypsum. Silver was formerly found in abundance in the form of chlorides, then as sulphides, occasionally associated with galena and now with pyrite and sulphantimonates. Tin has been present in the ore since the mines were opened, but it has been scarcely 20 years that the mines have been worked for that metal. The decrease in amount of silver in the ore has forced the miners to fall back upon the tin. The mines now being worked are El Socavon de la Virgen, Itos, Atocha, la Colorada, and San José.

El Socavon de la Virgen mine has been approaching exhaustion during recent years, and as the working costs are now high due to the great depth of the mine, the work is now only carried on on a small scale. Hoisting alone greatly increases the net cost of the concentrate. The concentration is done on inclined planes. The steam engine is driven with a boiler fired with coal or with *taquia*. This is the source of power on nearly every mine in Oruro where hydraulic power is entirely lacking. The ore now being mined is largely dense pyrite containing small grains of cassiterite and of argentiferous galena. The working of the Itos and Atocha mines is at times interfered with by the high cost of extraction. Nevertheless, the Atocha mine still produces tin ore of good grade. Silver occurs less frequently than in the Virgen mine. The ore is always a sulphide impregnated with the tin and silver. La Colorada mine is peculiar. It is the highest mine working on the deposit. The ore, which contains little silver, consists of an iron oxide containing compact beds of cassiterite. In the place of the usual hoist and shaft is a cable way for lowering the ore which greatly reduces the cost of mining. The San José has the largest workings in Oruro. There are two distinct mines, that of silver and that of tin. The ores are of argentiferous galena and cassiterite associated with pyrites or the oxide of iron. The ore is brought to the surface through two tunnels, one having the dimensions of a railway tunnel.

Huanuni

Huanuni is southeast of Oruro at a distance of 10 miles from Machacamarca station on the Antofagasta railway. The greatest mineralization is concentrated on Mount Posoconi which is connected to the Cordillera Real by a precipitous range. This mountain can be recognized from a distance by its blood-red color, due to a ferruginous clay deposit. The sedimentary schists are much folded. The numerous veins which cut the formation form a *stockwerk* of which the individual veins, about 3 ft. wide, run in all directions. Only a few continue for any distance in the general direction of the deposit, east and west. The veins are worked at an altitude of about 13,000 ft., Mount Posoconi reaching 14,500 ft. The vein filling is composed of sedimentary detritus and clay, containing crystals of cassiterite. Deeper in the mine, the vein matter is a harder rock with pyrite associated with large crystals of cassiterite. Then under the pyrite, pure beds of cassiterite of great thickness are often found. This formation is remarkably rich. It may be considered on a par with the celebrated deposits of Potosí and of Uncia. Only the oxidized ore is worked. The deposits are worked by two English companies, the Huanuni Tin Mining Company formed by M. Michin, and the Penny-Duncan Company. (Messrs. Penny and Duncan are two experienced Englishmen who came into Bolivia to work tin mines, and who have developed the veins at Huanuni and have just formed an important company.)

Pazna

The deposit of Pazna is on one of the spurs of the Cordillera Real and south of the department of Oruro. According to M. Frochot, the veins occur in fractures in a porphyry intrusion. The mineral occurs in a pure state, the crystals of cassiterite being of good size or forming masses in the quartz gangue. Some other veins, little developed at present, are quite ferruginous, containing much oxide of iron and pyrites associated with cassiterite. This deposit is being worked by three principal companies, the Avicaya, the Totoral and the Antequera. Lastly we have the Apacheta and the Morococala deposits in the neighborhood of Huanuni similar in formation to the last described above. The Morococala mine promised well but has been held back by difficulties among which are the numerous law suits which it has had to stand since the formation of the present company. On the frontier of the Cochabamba department, east of Oruro, the Negro Pabellon (Black Flag) mine is being worked.

Alluvial tin deposits are rather rare in Bolivia. In the districts with which we have been occupied few such deposits occur besides the ones at Japa Jopo and at Vilaque, already mentioned in connection with gold, and those of the region around Huanuni. The two first probably owe their origin to the erosion which has carried the mineral from the Huayna-Potosí district. They contain bismuth, cassiterite and gold. This placer cassiterite is sometimes found in pieces weighing three to six ounces. These deposits have been frequently abandoned and are worked irregularly. The deposits in the Huanuni neighborhood are more exclusively tin placers. But no serious work has been done there, the work, such as it is, being done by the natives of the region.

Treatment of Tin Ores

There are two distinct methods of treatment: (1) the ore is treated by the use of primitive apparatus without any mechanical preparation, properly speaking; (2) the ore is treated in regular concentration plants. For the first the ore brought to the ore yard of the mine is first broken by Indians who use a 3-lb. hammer for this purpose. It is then sorted by women called *palliris*. The reject is then ground under a crushing stone

weighing about 250 lb. and having a base generally convex, called a *quimbalete.* Sometimes the base is shod with an iron tire. The worker rocks the stone on a stone base upon which he throws a little ore, at the same time giving the stone a turning movement. The *quimbalete* and the die stone are usually granite or quartzite. The crushed ore is then washed in two kinds of apparatus. The *granza,* that is, the ore coarser than five millimeters is treated on hand jigs built with a stationary hutch and a movable screen. The fines are washed in a launder with its bottom set at an incline of 10 deg. with the surface, shaped to a slightly parabolic section. This surface is covered with moss to catch the fine mineral. The fine ore is spread over the bed of moss, and a stream of water is run in at the head of the launder. The rate of flow of this stream decreases as it approaches the foot of the launder, and concentrates the mineral by washing away the lighter particles. This washing is assisted by wash women, who by means of small wooden paddles, constantly bring the ore back to the head of the launder. This apparatus is nothing more than a modification of the Mexican *planilla,* where, however, it is considered good practice merely to throw on the water without aiding the washing by means of the stirrers.

The tailing from this apparatus is passed over an ordinary round buddle turned by hand by the Indians. Ultimately, in order to separate the oxide of iron from the cassiterite, the concentrate is given a final separation in a small barrel which resembles the keeve of Cornwall. Some of these primitive plants are improved to the extent of adding a jaw breaker or a chilean mill. The extraction by means of these jigs and launders varies much according to the workmen which operate them. A good wash woman can with the same mineral produce four times as much concentrate as another less skilful. In any case these methods are applied only to good grade ores, about 10 per cent. tin contents.

Mechanical Concentration

For treatment in concentration works the mineral is generally broken to five millimeters by a Blake breaker, and then crushed either in stamp or ball mills. The chilean mill is not generally used in Bolivia for the first crushing, except in the case of the copper ores of Corocoro. The stamps used are of three types: the ancient Cornwall, the California and the pneumatic. The latter gives a higher mechanical efficiency, the motive force being applied directly to the stamp stem through compressed air. The ore crushed to two to three millimeters is classified in trommels and hydraulic classifiers, and is then concentrated on jigs and tables. The Frue vanner is not used in Bolivia. The most generally used are the Wilfley and the Ferraris, the latter being better than the former from the point of view of structural solidity. The tailings from these apparatus are sometimes ground in chilean mills, the Huntington mill being abandoned more and more on account of the high repairs. The reground tailings are concentrated on buddles with concave or convex surfaces on revolving tables or even sometimes on Linkenbach tables. When the ore contains pyrites it is necessary to crush to one millimeter; then after a first concentration on the tables, to roast the concentrate to change the pyrite into oxide of iron for simplifying the separation of the iron from the cassiterite. Sometimes only a partial roast is given in order to form the magnetic oxide of iron, which is taken out by a magnetic separator. But the results from the use of the magnetic separator, however, leave something to be desired.

Reverberatory Roasting

The roasting of the minerals is done in reverberatory furnaces fired with turf or *taquia,* an operation which is long and expensive, and which is further complicated by the rarity of the air. The Compagnie Huanchaca, as we have seen above, roasts its pyritic minerals in Kauffmann mechanical furnaces. These furnaces at 13,000 ft. altitude give good results from the point of view of economy of fuel and of labor. The concentrates obtained, which are called *barilla,* contain from 50 to 70 per cent. of tin. They are shipped in bags containing 51 lb., and sold in Europe to the smelters.

Power may be furnished from "white coal" by the power plants, which are situated below the glaciers of the cordillera. When hydraulic power is lacking, recourse is had to steam, the boilers being fired with coal, or more frequently with *taquia,* turf or peat. However, it is becoming more and more preferred to use anthracite gas engines. The cost of a horsepower-hour with these is from 4 to 5c. Some of these works are well designed, and some are built entirely on one level, which requires too many elevators, there being no difficulty in finding a gravity site. The apparatus generally employed is simple, light weight and sectional. The question of transportation of material is of extreme importance in these difficultly accessible regions.

La Union Works

The Huayna-Potosí ores are treated in the Union works of the Compagnie de Huayna-Potosí y Milluni, which was formerly used for treating the silver ores of the region. This plant includes: One Blake crusher; two pneumatic stamps of 30 tons capacity each; one small four-ton chilean mill; eight Wilfley tables; one magnetic separator; 13 convex buddles; two four-hearth reverberatory furnaces. Formerly there were Frue vanners and round tables, which have been abandoned. Here magnetic concentration has for its object the separation of bismuth from the stanniferous concentrate. The concentrate obtained from the first Wilfleys, containing about 20 per cent. of tin, is given a partial roast, which transforms the pyrite into magnetic oxide. The magnetic separator gives a tin tailing containing 40 per cent., and magnetic products which contain nearly all of the bismuth, and of which the content in this metal is about 5 per cent. The tin concentrates are given a dead roast and reconcentrated, if necessary. The magnetic product is treated for bismuth in a special plant. It is lixiviated with perchloride of iron, which dissolves the bismuth, which is then precipitated on scrap iron. The impure bismuth is then calcined and shipped to the company's refinery at Havre, to be melted and refined. The bismuth tailing is reconcentrated for tin on the round buddles.

Power is furnished from a water-fall of 200 ft. The water is conducted through a 14-in. pipe and runs a 3-ft. Pelton water wheel. The water flows from the glaciers of the cordillera, and is retained by a dam, which forms a 100-acre lake with an available depth of water of 15 ft. Fifty horsepower are required. The plant is situated 21 miles from the Alto de la Paz station, and is connected by cart road to that station and to the port of Chilalaya on Lake Titicaca. The ore is brought to the works by a 2000-ft. cableway and a three-mile railway, the cars descending by gravity and returning by mule power. This arrangement, which is not good, as the cost of the concentrate is unduly high on account of it has, nevertheless, been retained because the necessary expenditures for a new plant cannot be made.

The Milluni Reduction Works

The Mulluni reduction works, which is not quite completed, comprises the following: One Blake crusher; two 30-ton pneumatic stamps; one impact screen; three Wilfley tables; one 10-ton Reynolds chilean mill; 10 convex round buddles; jigs will be added. The oxidized ore is concentrated but once, on Wilfleys. The sulphide ore is concentrated, the concentrates roasted dead and then again concentrated on Wilfleys, producing a 60 per cent. tin concentrate. The ore here contains no bismuth, and for this reason magnetic separators are not to be recommended as at la Union, as their effect on tin concentration is of no advantage.

Hydraulic power is generated by a 350-ft. fall. The water is brought in a 10-in. pipe to a two-nozzle 3-ft. Pelton wheel. The water is drawn from a reservoir 20 acres in extent, having 21 ft. of water available, the water being brought from the foot of the glacier by a three-mile ditch. As this plant will be doubled in size shortly, power will be brought

from the east side of the cordillera by electric transmission lines. The ores are brought to the works over inclined and aërial trams. The works are 15 miles from Alto Station, to which it is connected by a cart road.

Other Mines on the Milluni Deposit

The mines near Chacaltaya, Ventanani and Kaluyo lease the workings to *pirquineros,* who labor according to their own good pleasure, or rather according to the greater or less value of the ore. Development is on a reduced scale and many of the reduction works are about to be abandoned on account of the impossibility of keeping running. The concentration of the ore is done by the use of *quimbaletes,* hand jigs, launders, etc. A small plant has been erected at Chacaltaya to treat the tailings of the *pirquineros.* It consists of a Huntington mill and a Frue vanner, and is run by a water motor, but the transportation of the ore on men's backs is expensive, and work in this plant will have to be abandoned. In any case, the choice of equipment was not happy. The ore from Churiumani is treated on the usual primitive apparatus. The ore is lowered from the mines on small cable tramways, the buckets being of rawhide. The tailings are transported by a special cable tramway to a small plant, which consists of a Pelton wheel, a ball mill, a Wilfley and buddles. The operation in this plant is intermittent on account of lack of water for power.

This plant consists of: One Blake crusher; 10 California stamps, crushing 25 tons; one belt elevator for raising the pulp to the classifiers; three impact screens in series; two 3-compartment Harz jigs; one Huntington mill; two Wilfleys; one Callow screen; one Sperry buddle (round vibrating table); seven round buddles with pulp distributers. Only oxidized ore is treated. The water required for concentration is brought in a three-mile ditch, but the quantity is not sufficient for power. There is a 60-h.p. gas engine, which is to be supplanted with a steam engine, with boiler to be fired with *taquia,* to be used when the supply of petroleum fails. Besides the above plant there is another small concentrator at Colquiri, which is driven by a 10-h.p. petroleum engine, but it runs irregularly. There are a number of other small mines in the neighborhood which treat their ores by primitive methods.

The ores at Oruro are subjected to a simple sorting at the shaft, which produces a shipping grade of mineral. The residue is sent to other and better equipped works, some of which are situated a long distance from the mines. But the railway does this hauling reasonably, and the works are located where there is no lack of water, while it is impossible to make a complete concentration without a plentiful supply.

Ore Treatment at Oruro

At the Socavon la Virgen the ore is sorted and concentrated on hand jigs. The mine is connected by rail to the Antofagasta railway. The ore is shipped to the Machacamarca works. Hardly anything is now done to the ore at the mines at Itos and Atocha except to sort it. Whatever is not sorted out is carted to the Antofagasta railway station, to be sent to Machacamarca. The cart road can be recognized from a distance by its mineralized appearance, it being strewn with low-grade ore which would now be called payable. The ruins of an ancient Indian or Spanish installation are to be seen at Atocha. The plant at la Colorada comprises a steam-driven breaker, hand jigs and concentrating launders. A large quantity of tin concentrate is produced. The tailings are hauled on carts to the railway and shipped to Machacamarca. There are two steam-driven concentrators at San José, each containing breakers and power jigs, besides large sorting floors, as well as calcining furnaces for sulphide ores. Part of the ore is also sent to the Bella-Vista plant, at Poopo. The water necessary for concentration is furnished by dug wells, which are some distance away, on the great Oruro plain. It is pumped through pipe lines to the different plants.

This plant is 2½ miles from Machacamarca station on the Antofagasta railway, to which it is connected by rail. It receives the ores from Socavon de la Virgen, la Colorada, Itos and Atocha. Formerly only silver ores were treated, by amalgamation. The operation was carried on in a kind of pan made of a wooden tank provided with false bottoms of copper and furnished with copper stirrers. The crushed ore was mixed in these pans with salt and mercury. Lixiviation with hypo has been used for a number of years. Now the tin ores as well as the silver-ore tailings, are concentrated for tin. The plant requires 150 h.p., of which 50 are hydraulic.

Huanuni Works

These works are reproductions of the old Cornwall plants. The old stamps of that type and the concave buddles with pulp distributers are still used. The plants are at an altitude of 12,500 ft., and their situation at the bottom of the deep Huanuni valley provides shelter from the wind and mitigates the discomforts of the frosts. Water is scarce for power and even for concentration, the majority of the works being obliged to pump back and save the water from the tailings. Either steam or gas engines furnish the power. Huanuni is connected by a good road to Machacamarca station. The Huanuni Tin Mining Company treats its ores at el Balcon works, which comprises: One 60-h.p. anthracite-producer gas engine; 20 Cornwall-type stamps; two trommels and two hydraulic classifiers; two small pulp elevators; three two-compartment jigs; four Wilfley tables; one Huntington regrinding mill; seven concave buddles with distributers; three Rand slimers for the Wilfley tailings; two round tables. The middlings from the jigs go to the Huntington mills, and from the Wilfleys to the buddles.

This plant gets its water directly from a long ditch from Pata-Huanuni. The ore is brought to the plant on a single-cable aërial tramway, of which the cable is both tractor and track.

Besides this plant the company has the Colon concentrator which is innocent of all machine-driven apparatus. It contains a score of hand jigs and concentrating launders for the fine mineral. The existence of this annex to el Balcon works seems somewhat illogical, considering its primitive character, but it is partially explained by the fact that there is a small quantity of water at its site.

The Penny-Duncan Company treats its ores in two mechanical concentrators, Miraflores and Santa-Maria. The latter plant contains: 10 Cornwall stamps; three two-compartment jigs; 13 concave buddles; three slime tables, of which one is an Acme. Water is pumped back from the tailings for further use.

The motive power is supplied by a 43-h.p. coal-fired boiler and engine and a small set fired with *taquia* and peat. A new 90-h.p. steam engine and a ball mill are to be added. The ore is brought directly from the mine over a tramway. A part of this ore is hauled on carts to the Santa Maria plant which contains: one breaker; one ball mill; 10 Cornish stamps; two pulp elevators; four three-compartment jigs; 16 concave buddles with distributers; two steam engines, coal fired; pumps for concentration water. In all of these works, only oxidized ore is treated.

The Poopo Works

This smeltery at Altaña is the only one in Bolivia, outside of the Potosí district. The works include, besides the smeltery, a mechanical concentrator and a roasting furnace for the stanniferous pyrite. These furnaces are built with flat arches and use a comparatively small amount of fuel. The plant is at an altitude of 12,300-ft. some miles south of Machacamarca and on the Antofagasta railway. Near Altaña is the Bella Vista plant which treats the ores from the San José de Oruro mine, lixiviating the silver ores. The plant has a small amount of hydraulic power. The various plants of the companies in Pazna use California stamps, mechanical jigs, Wilfley and Ferraris tables and round buddles.

Recovery of Coal from Pillars

By A. E. Reppert *

Results of an effort to determine the proper width of pillars under varying conditions, with a view to maximum recovery of coal.

*Superintendent of mining, Maryland division, the Consolidation Coal Company.

NOTE—Paper read before the summer meeting of the West Virginia Coal Mining Institute, White Sulphur Springs, W. Va., June 20, 1911.

In treating this subject an effort has been made to demonstrate the action of the overlying strata when breaking in connection with the removal of pillars, to determine the proper width of pillars under varying conditions, pitch and thickness of seam, size of falls to be made and other conditions governing a system of mining coal pillars, with a view of largest recovery possible, consistent with economy and safety to the workman. All mining will be referred to as done in the Fairmont and Georges Creek regions.

Fig. 3 shows the entire seam, the top coal being left up for roof, which is usually lost when pillars are removed. The strata overlying this seam consists of shale, limestone, sandstone and coal. This shale, sandstone and limestone vary considerably throughout the same coalfield. One section may show sand rock 10 ft. thick, while 1000 ft. away another section will contain shale at the same horizon.

These conditions make it a difficult matter to lay down a fixed rule for the size of pillars to be left, until a general knowledge of the strata over the entire coalfield has been obtained, which takes years of actual experience and careful observation in the mine workings and on the surface.

Fig. 1 shows an actual section taken in No. 8 mine owned by the Consolidation Coal Company in the Maryland division. This section extends from the Pittsburg to the Redstone seam. The coal was mined out in a space of 80 ft. by 90 ft. The distance from the floor of the Pittsburg to the Redstone is 40 ft. The strata between these two seams at this point are principally shale and are not so hard to break as in other sections where sand rock is found. This fall at the Redstone is approximately 30 ft. wide, leaving a space at the top of 2½ ft. The angle of fracture on the side next to the solid coal is 35 deg. from the vertical, while on the other side, along the open rooms, it is 26 deg. This indicates that the fracture along the solid coal is at a greater angle than the one along the face of the workings.

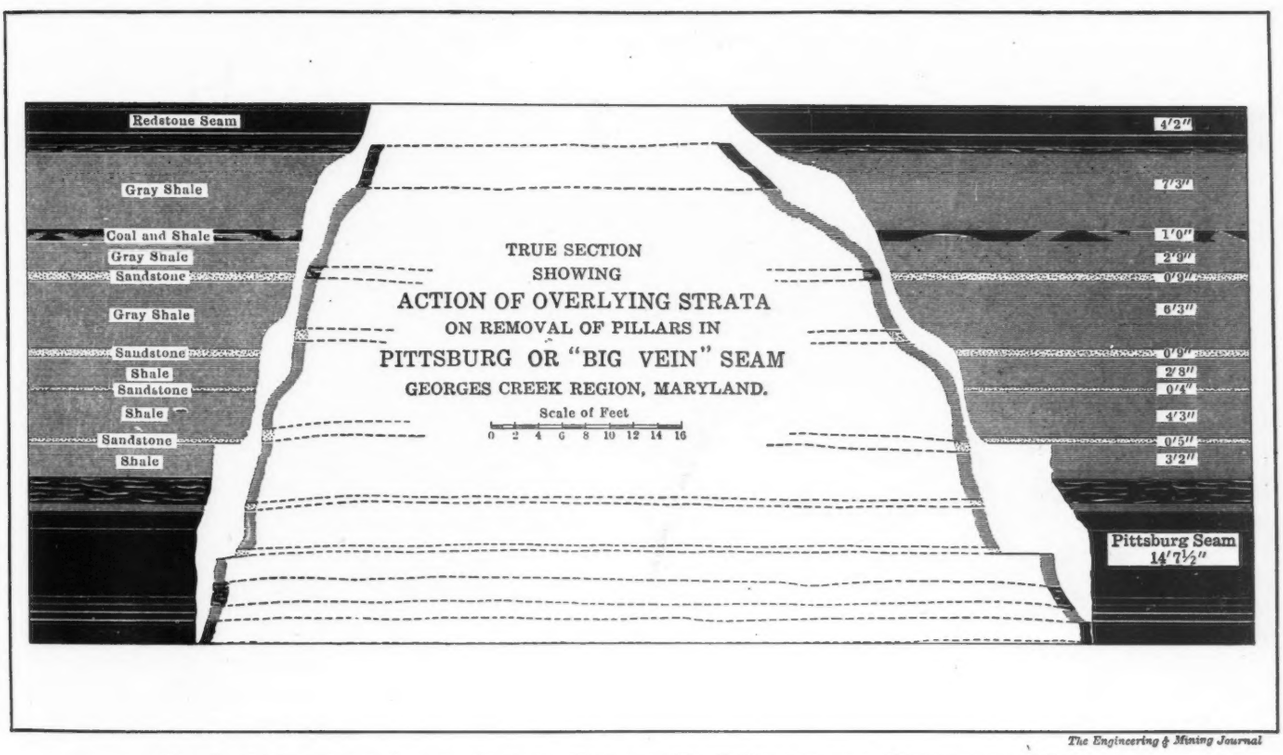


FIG. 1. SHOWING AN ACTUAL SECTION TAKEN IN NO. 8 MINE OF THE CONSOLIDATION COMPANY

Fig. 2 shows the probable action of the overlying strata where the surface is 250 ft. above the floor of the Pittsburg seam. The pillars are drawn back 220 ft. and the fall extends to the surface when this distance has been obtained.

STARTING THE FIRST PILLAR

The first pillar is started back at *A* and fracture due to the first break is shown at *B*. This extends to the space at *C*. The distance from *A* to *B* is 40 ft., or 40 ft. of pillar has been taken out when first fall occurs.

The second fall occurs at point *D* and fracture line extends to space *E* at the Redstone seam. This shows 60 ft. of pillar taken out and the probable hight that has broken down is to the Redstone coal, or about forty feet.

The third fall extends to *F* and the fourth to *G*, the line of fracture in the latter case extending to a space *H* at the top of the Lower Sewickley, which is 85 ft. above the floor of the Pittsburg seam. The pillars have been drawn back one hundred feet.

When pillars have been drawn back a distance of 160 ft. to *K*, the break extends to the point *L* at the bottom of the Sewickley sandstone, which is 14 ft. thick.

When the pillars are drawn back a distance of 220 ft. to *M*, the fracture extends to the surface at *N* a hight of 250 ft. above the floor of the Pittsburg

seam and at the horizon of the Waynesburg seam. This fracture line is approximately correct as shown on Fig. 2 and is based on actual surveys and observations of a large number of surface breaks in relation to the mine workings.

Fig. 4 is a plan illustrating a case from actual location. A block of coal 300 ft. by 350 ft. has been mined and pillared and the strata above have been fractured to the surface as shown by the approximately parallel broken lines.

The first surface break is between rooms No. 1 and No. 2 and is about 70 ft. from the barrier pillar. The strata at this point is 170 ft. The average angle of fracture from the vertical is 22½ deg. No. 1 pillar was taken out from No. 2 room, No. 2 pillar No. 3 room and No. 3 pillar from No. 4 room. The break along barrier pillar at top of rooms is at an angle of 14 deg. from the vertical, while the break along the left-hand pillar of No. 4 room is nearly vertical.

If the foreman observes closely the condition of each pillar and the action of the falls when made, he is able to decide the size of stump to be taken out to relieve the weight at the right time. The plan of taking out coal, regardless of the action of the strata, until the place falls, which is the rule at a great many mines throughout the United States, is certainly a dangerous as well as expensive practice and very often produces squeezes with a resultant small percentage of recovery.

If one block of coal is taken out without a fall and the fall is not made by drawing the timber before another stump has been started, the weight becomes manifest before this stump is removed, thereby making a condition that is dangerous, causes the excessive use of timber, produces a large percentage of fine coal and very often a loss of from 20 to 30 per cent. of the pillar. Furthermore, if the strata is thick, a squeeze takes place sooner or later under such conditions, closing all the work in the immediate vicinity and generally extending to a point where there is sufficient coal to withstand the weight of the overlying strata.

Each fall should be made of sufficient size and the stump removed in a given period, in order to have the coal out and timber drawn by the time a section of the strata breaks loose. This should greatly relieve any weight on the next block while coal is being taken out. By following this up systematically, it is possible to prevent excessive weight on the pillars at all times, with a high percentage of recovery and a reduced timber cost, and with increased safety to the workman.

As to the thickness of pillars in the Pittsburg seam, with the strata from 100 to 500 ft. thick, the following rule should be a safe one to follow, where the pitch is from one to five per cent.:

TABLE GIVING THICKNESS OF PILLARS

Thickness of Surface, Feet	Thickness of Pillars, Georges Creek, Feet	Thickness of Pillars, Fairmont, Feet
100	25	18
150	32	20
200	40	25
250	50	30
300	60	35
350	70	40
400	80	45
450	90	50
500	100	55

These figures are based on experience in this seam, where the floor or bottom is hard and not affected by water. For a fireclay bottom, somewhat thicker pillars would be necessary to withstand any extraordinary weight that takes place. Rooms should not be more than 14 ft. in width in the Georges Creek region and 20 ft. in the Fairmont district.

One of the abuses practised in the mining of coal pillars is "slabbing," or "taking up a skip." This is usually done to prevent the laying of turns. When the room is driven up and the pillar ready to start, the foreman instructs the miner to start back say 100 ft. from the face, take 15 ft. of a slab up and bring the pillar back. If the miner is not watched closely, before the place is up 50 ft. it is so wide that it falls, or if he is successful in getting up the room with the skip and starts back with the pillar, as soon as the fall occurs, it usually covers up a

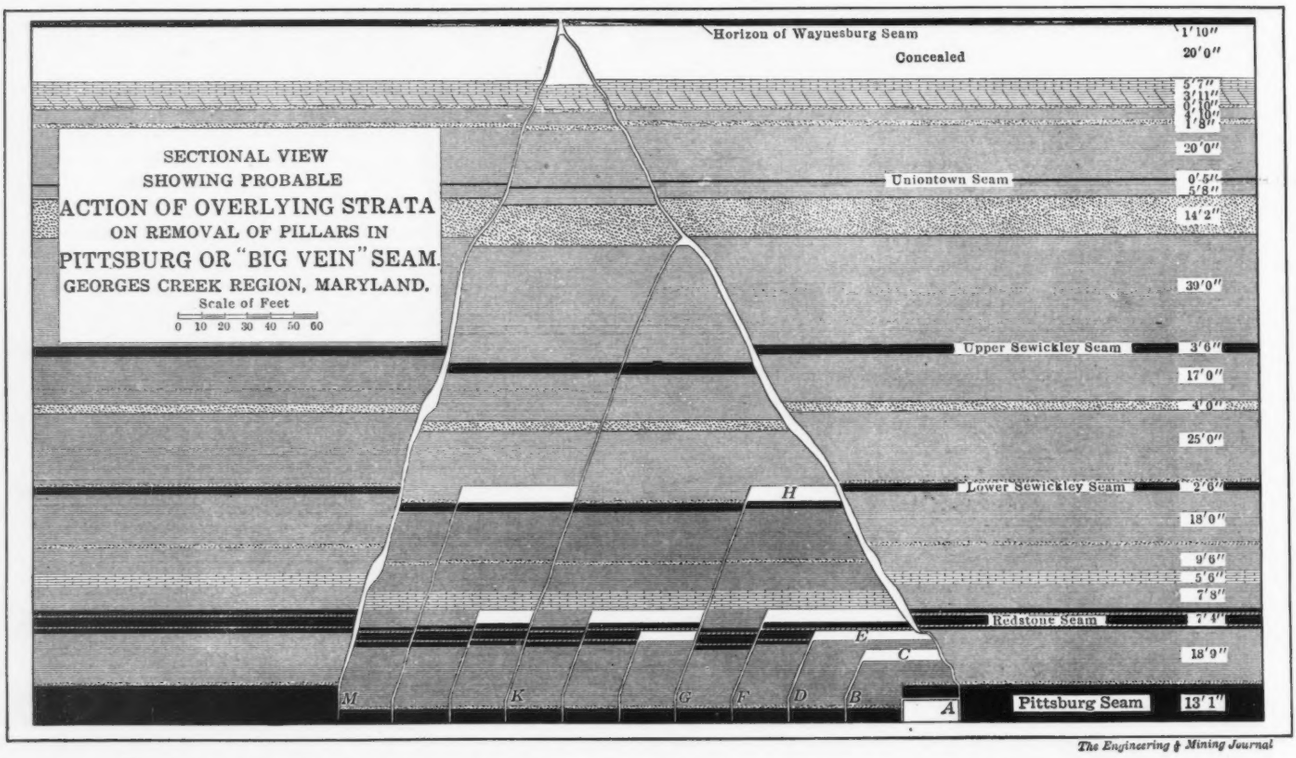


FIG. 2. ACTION OF STRATA WHERE THE SURFACE IS 250 FT. ABOVE THE FLOOR OF THE PITTSBURG SEAM

STRATA FRACTURES IN VERTICAL LINE

Fig 4, taken in connection with Figs. 1 and 2, therefore, indicates that, until a pillar fall extends to the surface, the fracture is conical in shape, but as the pillar line extends down the rooms beyond the first surface break, the strata fracture on a nearly vertical line.

A good recovery of coal from pillars depends largely on the foreman or pillar bosses and the miners, or the men who do the actual work. All pillars should be inspected daily by the foreman or his assistants, one of whom should be on hand when any fall is made.

part or all of the pillar, down to where the slab or skip was started. Then the expense to mine owner and danger to miner commence. At the edge of fall the pillar is then cut through and an effort made to take the coal out between the two falls, with the result that 50 per cent. of the coal is lost with an extra amount of timber used, while the coal recovered is in such poor marketable condition from crushing and fine slate that the salesman and manager are confronted with numerous kicks and complaints from the customer.

The Splitting of Pillars

The splitting of the pillars to avoid cleaning up rooms that have been left standing is another dangerous and sometimes expensive practice. It appears that, if the cleaning up and timbering of these rooms be prohibited on account of expense, the proper method would be to split the pillar leaving a few feet next to the room and the thicker portion of the pillar next to the fall. If the pillar is not thick enough to do this, the only thing left is the "skip" or "slab," which should only be taken wide enough for the car and clearance for the driver to pass. Splitting pillars in the center has been found to be undesirable, unless in first working they have been left double the size necessary.

Taking stumps out by driving along or up the fall side of a pillar is objectionable as a slide from the next pillar fall often takes place leaving a portion of the stump that is impracticable to recover.

All mine work should be so arranged that the pillar can be started back as soon as the room is finished. Where the faces and butts are absent as in the case in the Georges Creek region, points should be set for all crosscuts through pillars where the thickness exceeds 30 ft. The distance these crosscuts should be apart, depends on the size of the pillar. In the Georges Creek field the following rule has given good results:

With pillars 25 ft. thick, blocks 15 ft. by 25 ft. should be cut off and split up, leaving 4 ft. next to the fall. This 4 ft. stump should be taken out first and the fall made. The remaining stump 10 ft. by 15 ft. should then be taken out from the main room. For a pillar 32 ft. thick, the same size block can be cut off and a 10 ft. stump left on the fall or gob side. The same size stump can then be removed on the room side as for a 25 ft. pillar. All pillars can be crosscut in this manner until a thickness of 60 ft. is reached, after which larger blocks should be cut off. For a 100-ft. pillar the cuts should be from 30 to 35 ft. apart and split through twice, thus making about six falls in a block 35 ft. by 100 ft.

Where roof is good and coal hard, as found in some sections of the Fairmont field, falls can be made larger, but where roof is bad and coal soft, it has been found that the short falls give the best results.

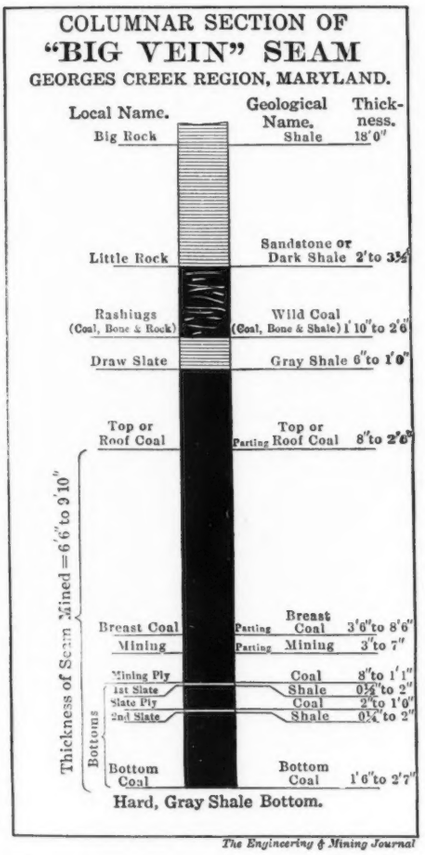


FIG. 3. SHOWING ENTIRE SEAM WITH TOP COAL LEFT UP

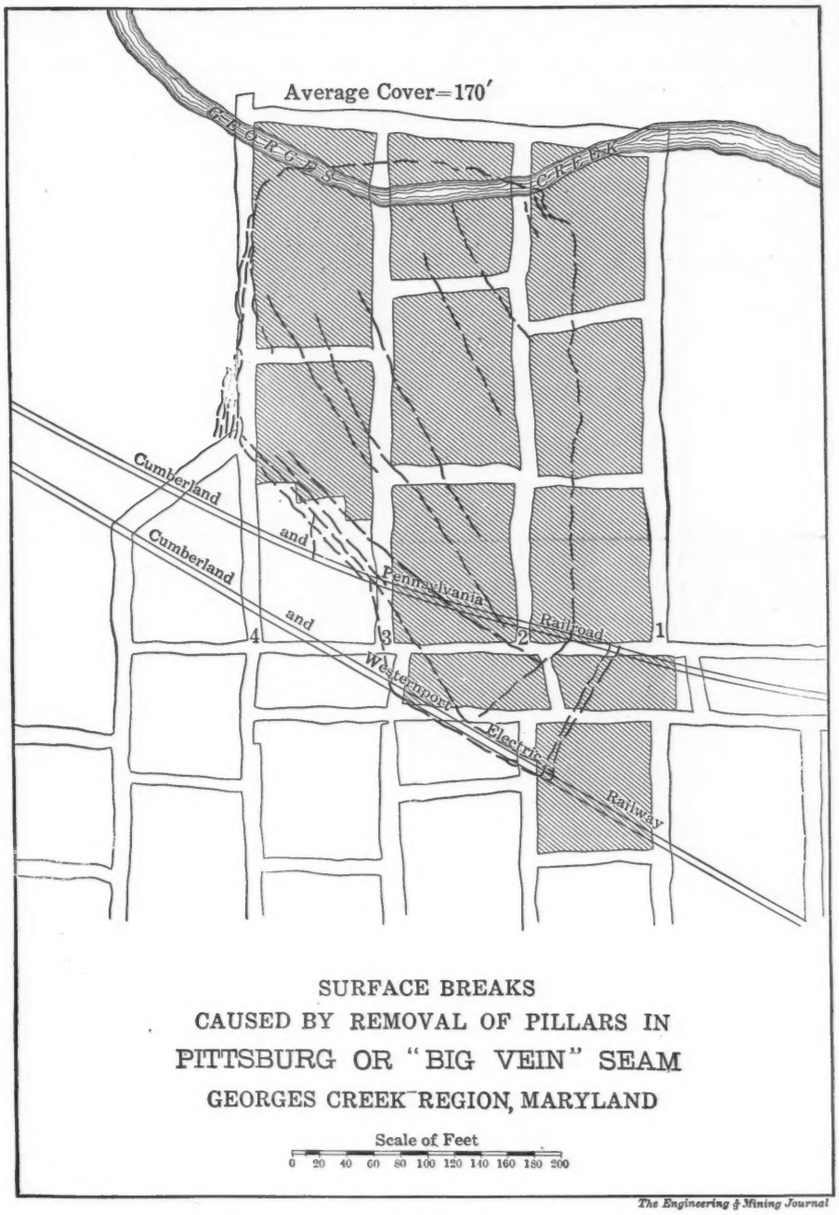


FIG. 4. PLAN ILLUSTRATING A CASE OF SURFACE SUBSIDENCE WHERE A 300-FT. BLOCK OF COAL HAS BEEN MINED

A System of Setting Posts

In the Georges Creek region a system of setting posts 2 ft. apart on lower side of crosscuts in pillar work and flush against the coal, has given good results in protecting the stump below from the fall above. When set in good condition, these posts allow all the coal to be taken out to the fall above, thus increasing the recovery at least two per cent.

Careful surveys and measurements by the Engineering Department of The Consolidation Coal Company in the Maryland field for the five years ending Jan. 1, 1911, show a recovery of 86 per cent. of coal by that company from "Big Vein" pillars. Ten per cent. of this pillar coal was recovered from old workings where the rooms have been standing from 15 to 30 years with pillars left too small to properly support the strata. In these old workings 75 per cent. of the coal in pillars is being recovered. Exclusive of this and following the method above outlined, the recovery from pillars is over 90 per cent.

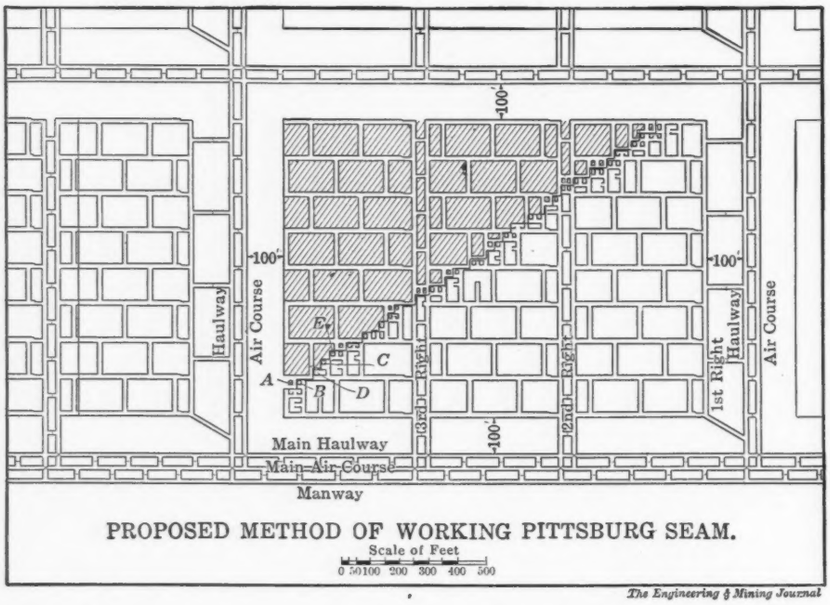


Fig. 5. This Plan Consists in Driving Three Room Headings in Each Panel

Fig. 5 shows proposed method of working the Pittsburg seam. This plan consists in driving three room headings in each panel, making a block of 800 ft. by 1100 ft. The third heading should be completed first and No. 8 pillar started back from No. 7 room. All falls should be stepped and should be from 12 ft. to 15 ft. apart. The blocks should be taken out in the following order: Block *A* in No. 1 pillar third heading has been removed. Block *B* should be taken out next. Block *C* in No. 2 pillar is now removed. Block *D* should then be split and top end taken out first. This process is repeated throughout the entire panel. Care should be taken when any extra weight manifests itself to stop all places that might throw weight on the weak points until the latter have been removed. This work should be left to the judgment of the foreman or pillar boss.

COLLIERY NOTES

Fire has been burning in one of the mines of the Crow's Nest Pass Coal Company, at Michel, British Columbia. There has not been any loss of life, but it has been found necessary to seal the mine, which is likely to be closed for several months.

The new mining laws of Alabama have been printed in booklet form and are being distributed by Chief State Mine Inspector Charles H. Nesbitt to the operators. The operators are being requested to read the new laws carefully, as it is proposed to enforce them.

The new "Mines Accidents" law, just enacted in England, requires that no person, unless properly authorized, shall be allowed to enter a mine after an explosion of firedamp or coal dust, or after the occurrence of a fire, for the purpose of engaging in rescue work.

The Board of Conciliation and Investigation, appointed in accordance with the provisions of the Industrial Disputes Investigation Act, of Canada, after hearing much evidence in the matter of the dispute between the Western Coal Operators' Association and District No. 18, United Mine Workers of America, the latter representing about 7000 coal and coke workers, who stopped work at the end of April at numerous collieries in Eastern British Columbia and Western Alberta, has been unable to effect an agreement between the parties concerned. The board visited several mines where conditions and wage rates are in dispute.

Fusion in Platinum Crucibles

If the present high price of platinum has no other effect, it will at least set the chemist to making better use of his platinum ware. The following suggestions are made toward getting better use out of platinum crucibles. The ordinary method of fusing at a high heat and running up the fusion around the sides of the crucible, usually results in a large portion of the melt settling upon the bottom of the crucible and taking a long time to dissolve.[1] The attempt is sometimes made to hurry getting this loose by pinching the bottom of the crucible, which, of course, tends to crack it.

To avoid these troubles, take a shallow 5-in. evaporating dish and bend up a clay triangle so as to fit in the center of this. In the triangle put a 50-c.c. nickel crucible so that it is held solid, but leaving about an inch space between the bottom of the crucible and the evaporating dish. Fill the dish with water up to the triangle.

When the fusion in the platinum is finished, raise the heat for a minute or two, then remove the cover of the crucible and at once pour the fusion into the nickel crucible by taking up the platinum crucible in the forceps by one edge. Pick up the nickel crucible in the forceps, tap lightly on the table, and drop the button out into a casserole half full of hot water. Cover the casserole. The hot water will immediately disintegrate the hot button. Place the platinum crucible in this water, and cover, and after a few minutes it can be taken out and rinsed off and, in the majority of cases, will be entirely cleaned.

If necessary, it can be rinsed in acid and this acid used in helping to dissolve the button from the fusion. The button will leave the nickel crucible clean, but if there is any suspicion as to this, the crucible can be rinsed in hot water. If this is done, however, it must be dried carefully before the next fusion. A drop or two of water in this crucible will cause startling results if a hot melt is poured into it.

For most fusions, the blast lamp is not necessary, in spite of what the textbooks say. A good Bunsen burner will give all of the heat needed, except for a few iron ores. The heat should be kept low until the fusion is well under way, and in no case should the method be followed of keeping the crucible in the hottest flame of the blast lamp for 15 minutes.

[Another method practised formerly at the Globe plant in Denver, was to pour the fusion on a polished steel plate, of sufficient size to insure rapid cooling of the button. The nickel crucible is probably better, but the other can often be used when no nickel crucible is available.—Editor.]

[1] *Chem. Eng.*, May, 1911.

NEW PUBLICATIONS

URANMINERALIEN IN SACHSEN. By C. Schniffner. 6½x9½, pp. 23, paper. Herman Köhler, Freiberg i. Saxony.

THE BREMEN OIL FIELD. By J. A. Bownocker, Pp. 68. Bull. 12, Geological Survey of Ohio, Columbus, October, 1910.

BIENNIAL REPORT OF COLORADO STATE BUREAU OF MINES, 1909 AND 1910. T. J. Dalzell, Commissioner of Mines, Denver.

WELL-DRILLING METHODS. By Isaiah Bowman. Pp. 139. Water-Supply Paper 257, U. S. Geological Survey, Washington, D. C.

REPORT OF PROCEEDINGS OF THE AMERICAN MINING CONGRESS, Vol. XIII, 1910. 6x9, pp. 392, paper. Office of the Secretary, Denver, Colo.

REPORT OF THE DEPARTMENT OF MINES OF NOVA SCOTIA FOR 1910. 6½x9¼, pp. 249, paper. Commissioner of Public Works and Mines, Halifax, N. S.

THE STATE GEOLOGICAL SURVEYS OF THE UNITED STATES. Compiled under the direction of C. W. Hayes. Bull. 465, U. S. Geological Survey, Washington.

THE PRODUCTION OF COAL IN 1909. By Edward W. Parker. Advance chapter from Mineral Resources of the U. S., 1909. U. S. Geological Survey, Washington.

BIENNIAL REPORT OF THE STATE GEOLOGIST, 1909-1910. By Joseph Hyde Pratt. Pp. 152. North Carolina Geological and Economic Survey, Chapel Hill.

MINERAL RESOURCES OF JOHNSTOWN, PENNSYLVANIA, AND VICINITY. By W. C. Phalen and Lawrence Martin. Pp. 142. Bull. 447, U. S. Geological Survey, Washington.

REVIEW OF THE COAL TRADE IN 1910. Reprinted from "Colliery Guardian," Jan. 6, 13 and 20, 1911. 5½x8½, pp. 151, paper. Colliery Guardian Company, Ltd., London.

PRELIMINARY REPORT ON THE PEAT DEPOSITS OF FLORIDA. By Roland M. Harper. Pp. 375. From the Third Annual Report, Florida State Geological Survey, Tallahassee.

CID MINING DISTRICT OF DAVIDSON COUNTY, NORTH CAROLINA. By Joseph E. Pogue. Pp. 144. Bull. No. 22, North Carolina Geological and Economic Survey, Chapel Hill.

SMOLEY'S PARALLEL TABLES OF LOGARITHMS AND SQUARES. Sixth Edition, Revised. By Constantine Smoley. 5x7, pp. 174, leather. Engineering News Publishing Company, New York.

BIBLIOGRAPHY OF TENNESSEE'S GEOLOGY, SOILS, DRAINAGE, FORESTRY, ETC. By Elizabeth Cockrill. Pp. 119. Extract from Bull. No. 1, State Geological Survey, Nashville, Tenn.

INVESTIGATION OF THE PEAT BOGS, AND INDUSTRY OF CANADA, DURING THE SEASON 1909-10. Second Edition. By Aleph Anrep, Jr. 6½x10, pp. 44, paper. Bull. 4, Canada Department of Mines, Ottawa, Ontario.

TWENTY-THIRD ANNUAL REPORT OF THE BUREAU OF MINES, MINING AND MINE INSPECTION OF THE STATE OF MISSOURI FOR THE YEAR ENDED DECEMBER 31, 1909. By George Bartholomaeus. Pp. 176. Hugh Stephens Printing Company, Jefferson City, Mo.

THE OREBODIES OF THE ZEEHAN FIELD. By W. H. Twelvetrees and J. Keith Ward. 5½x8½, pp. 165. Accompanied by supplement (under separate cover), containing geological map and mine plans. Geol. Survey, Bull. No. 8, Dept. of Mines, Hobart, Tasmania.

EXPERIENCES SUR LES VARIATIONS DES CHARGES-LIMITES DES EXPLOSIFS SUIVANT LES SECTIONS DES GALERIES. By Victor Watteyne and J. Bolle. Extrait des Annales des Mines de Belgique, T. XVI. PP. 33. Ministère de l'Industrie et du Travail, Brussels, Belgium.

MAGNETIC CONCENTRATION EXPERIMENTS WITH IRON ORES OF THE BRISTOL MINES, QUE.; IRON ORES OF THE BATHHURST MINES, NEW BRUNSWICK; A COPPER NICKEL ORE FROM NAIRN, ONTARIO. By George C. Mackenzie. 6½x9¾, pp. 28, paper. Bull. 5, Canada Department of Mines, Ottawa, Ontario.

ZERKLEINERUNGSVORRICHTUNGEN UND MAHLANLAGEN. By Carl Naske. Part of Series Chemische Technologie in Einzelderstellungen, Ferdinand Fischer. 6½x9, pp. 235; 15 marks. Otto Spamer, Leipzig.

This book on crushing and grinding machinery may be divided into five sections: (1) crushing; (2) screening; (3) dust collection; (4) storage and packing of products; and (5) complete plants. Under crushing we find theory of crushing, breakers, rolls, chilean mills, cone mills, impact machines, gravity stamps, steam stamps, hydraulic stamps, grinders and roller, ball and tube mills. Screening covers not only grizzlies, trommels and shaking screens but includes also air separators of various types for fine material. Under dust collection we find settling chambers, dry filters or baghouses, centrifugal collectors, water-spray apparatus and wet filters. Storage and packing include bins and the machinery necessary for handling various kinds of products preparatory to shipment.

Complete plants are described for the treatment of phosphate, superphosphate, paint, sal-ammoniac, hyposulphite, dolomite, common salt, clay for earthenware, road material, drugs and spices. The author appears to have covered this field thoroughly, especially in dealing with crushing apparatus, and the reader can hardly recall any type of machine that has been omitted. As a rule no attempt is made to go into great detail—nor would it be possible to do so within the limits set for the size of this book—so each description is brief. The book is designed for the industrial chemist but it will be found of value by the engineer and the ore dresser. We are greatly indebted to the author for having searched books, periodicals and catalogs for us and for having gathered so much information into one compact volume.

PRINCIPLES OF INDUSTRIAL ENGINEERING. By Charles Buxton Going. 6¼x9½, pp. 174. McGraw-Hill Book Company, New York, N. Y.

The subject matter of this book: The origin of the industrial system; reflex influences of the industrial system; principles of industrial organization, forms of industrial ownership; the nature and distribution of expense; the primary wage systems; philosophy of labor management; materials; is substantially the text of a series of lectures originally prepared for delivery at Columbia University. The analysis of the evolution of the present industrial system is interesting, and the discussion of the advantages and disadvantages of the various wage systems clear, but the book needs to be supplemented, as were the lectures, by the writings of such men as Emerson and Gantt, to be of practical service.

THE OFFICIAL DIRECTORY OF MINES AND ESTATES OF MEXICO. Vol. XI, September, 1910. 10x12½, pp. 263. John R. Southworth, Mexico, D. F.

The Official Directory of Mines and Estates of Mexico, edition of September, 1910, has been issued. This directory is Vol. 11 of a series of directories which have been prepared and published by John R. Southworth, of Mexico City. The directory includes interesting general data concerning the history of mining in the Republic, the publication in English and Spanish of the new Mexican mining law, lists of the various federal and state officials connected with mining, and a directory of the principal Mexican mines with rather inadequate and sometimes incorrect descriptive information concerning them. The difficulties of preparing a satisfactory mining directory are well recognized, but this last edition of the Mexican directory does not appear to have accomplished a great deal toward overcoming those difficulties. The directory also includes a list of the landed estates in Mexico, with the owners' names and addresses.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Prof. Robert H. Richards went to the Lake Superior country on July 11.

John D. Ryan, president of the International Smelting and Refining Company, has been making an inspection of the company's plants in Utah.

Charles W. Newton, superintendent of the Butte & Ballaklava Copper Company, Butte, Mont., is on a business trip to Duluth, Detroit and other Eastern points.

Leland D. Adams, formerly connected with the Miami and Ray mines in Arizona, is now superintendent of the mines of the Precious Metal Corporation, at Weedon, Quebec.

The Mines Management Company, New York, has been retained to make an examination of the Carissa mine, near Lander, Wyo. H. P. Henderson has charge of the work.

Joseph Virgin has resigned his position as underground manager for the Plymouth Coal and Mining Company, at Plymouth, W. Va. He has had many years of experience in mining.

Zay Jeffries, formerly in charge of the Ideal mine and mill, near Custer, S. D., has been appointed instructor in metallurgy and ore dressing in the Case School of Applied Science, at Cleveland, Ohio.

Chester Wells Purington announces that he has taken offices at 62 London Wall, London, E. C., England, and will continue to specialize in the examination of mining properties in the Russian Empire.

John M. Boutwell, consulting geologist for Phelps, Dodge & Co., is making a survey of the mining geology of the property of the Moctezuma Copper Company at Pilares de Nacozari, Sonora, Mex.

J. Cuthbert Welch, who has been superintendent of the smelting works of the East Butte Copper Company at Butte, Mont., has resigned that position owing to the illness of his wife, which has necessitated removal to a more congenial climate. Mr. Welch is at present at Spokane, Wash.

W. M. Brewer, of Victoria, B. C., has resigned as president and director of the Pacific Metals Company, Ltd., to accept the position of general manager for the Matanuska Gold Mines, Ltd., owning free gold quartz property in the Matanuska district, near the head of Cook inlet, Alaska. Mr. Brewer left Victoria for the North early in July.

Philip Argall, who left Denver recently on a trip to Alaska, was on the ss. "Spokane," which struck a rock and foundered in Seymour narrows on the night of June 29. Mr. Argall was accompanied by two of his daughters. All of the Argalls were saved and have returned to Denver. Mr. and Mrs. Gardner Williams, of Washington, D. C., were also on the steamship. Mrs. Williams was killed.

The United States Appraiser of Merchandise at the port of New York is looking for an iron and steel expert. About $2,000,000 worth of steel is imported at New York each year. The examiners under the appraiser examine, classify and value this for the assessment of duty. The maximum legal salary for the position is $3500 per annum. Examiners are customarily paid from $1800 to $2500 per annum on their entry into the service.

James O'Donnell and J. R. Zumwalt, for several years operators in the Kern River and other oil districts of California, have been selected by Canadian industrial interests believed to be headed by the Canadian Northern Railway to explore northern Alberta and make expert report on the petroleum possibilities of the section watered by the upper Athabasca river. They will leave Bakersfield, Cal., about Aug. 1, and will join the Canadian party at Edmonton.

OBITUARY

Andrew V. Corry died at Butte, Mont., June 10, aged 74 years. He was born in Maryland and went to the West when a young man. He was for several years engaged in mining near Georgetown, Colo. About 1864 he went to Montana and for some time worked placer mines in Alder gulch, near Virginia City. He was one of the first settlers at Butte, and had resided there for many years. He had interests in many mines in Montana.

John B. Paul, at one time superintendent of the Big Bonanza at Virginia City, Nev., died at Stockton, Cal., June 30. He was one of the intimate associates of Stanford, Mackay, Flood and other old time Comstock miners. Mr. Paul went to California from Missouri in 1852, and early in his time engaged in hydraulic mining at North Bloomfield, Nevada county. He went to Nevada when the Comstock was the biggest mining enterprise in the West. In later years he had made his home in California. His wife, two sons and a daughter survive.

The official inquiry into the cause of the death of Samuel Alexander Tomes, superintendent of the Denny Renton Clay and Coal Company's No. 2 mine at Taylor, King county, Wash., which fatality occurred about three months ago, has resulted in the conclusion that it was purely accidental. Tomes and others entered the mine by one way and advanced to a face that had just been lighted for firing by men who left the working by a different route. Strange to say the smell of burning fuse does not appear to have been noticed, so that the men who met with disaster were close to the face of coal when the blast went off. The late Mr. Tomes was born in Allegheny, Penn., in 1869. In 1888 he graduated from Meadville college as civil and mining engineer. In 1892, in Pittsburg, he obtained a certificate of competency as mining boss. Afterward he entered into partnership with J. W. Patterson, and the firm conducted an engineering business in Pittsburg. Later he went to Colorado, where he remained two years, and then returned to Pittsburg where he was chief engineer for the Pittsburg Buffalo Company. During recent years he had been engaged in connection with coal mining in the Northwest, first as resident engineer at Roslyn, Wash., for the Northwestern Improvement Company, and since then at the Taylor mines.

A. B. Cockerill, for many years prominently identified with the zinc-smelting industry of the United States, died at South Pittsburg, Tenn., July 6. His death is ascribed to heat prostration while playing tennis. Mr. Cockerill grew up in the zinc-smelting business in Missouri and Kansas in the old days, before the practice in zinc smelting in that region had been reduced to the scientific basis of the present time. For many years he was associated with B. F. Hobart, of St. Louis, and was prominent in the consolidation of a large number of the smelting works of Missouri and Kansas under the title of the Cherokee-Lanyon Spelter Company, of which Mr. Cockerill became the general manager. This was the first important consolidation in the western zinc-smelting business, and for two or three years the Cherokee-Lanyon Spelter Company was the largest producer of zinc. Its works consisted chiefly of the old coal-fired plants, which within a few years were put out of business by the competition of the newer plants using natural gas. The Cherokee-Lanyon Spelter Company erected works at Iola, but never gained a strong foothold in the new field, and after a while failed to meet its financial obligations. Mr. Cockerill then organized the Cockerill Zinc Company, which took over some of the old works of the Cherokee-Lanyon Spelter Company and erected a new plant at Altoona, Kansas. Early in 1910 the Cockerill Zinc Company also failed. Since then Mr. Cockerill had been engaged in a manufacturing business in Tennessee. Mr. Cockerill was an alert, genial man who possessed many friends in the zinc business. He was a type of the old-time smelters.

SOCIETIES and TECHNICAL SCHOOLS

Queen's University—Dr. James Douglas, of New York, has donated $50,000 to Queen's University, Kingston, Ont., for the endowment of the chair of Colonial History.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

July 5—The plan for controlling flood waters of the Sacramento and San Joaquin rivers, submitted by Mayor Cheney in charge of the débris commission, and recommended to Congress by the Secretary of War, is not directly a mining measure, but the ultimate accomplishment will advance the mining industry in both hydraulic and dredging branches. The plan is a substitute for the Dabney plan, which contemplated the widening of the whole of the Sacramento river within the Sacramento and San Joaquin basins. It was concluded that the Dabney plan would require extension and that would sacrifice a great deal of land otherwise adapted to agriculture. The present plan is known as the by-pass system, providing for an auxiliary channel through the low lands at some distance from the main river channel, through which the greater portion of the flood waters would pass. The plan involves the building of levees, excavation of channels, construction of spillways, bridges and other accessories, and the purchase of some 80,000 acres of land and rights of way. The total estimated cost is $33,800,000 (including $800,000 already appropriated), of which it is recommended that the State pay two-thirds and the Federal Government one-third. Recent work of the Federal engineers has been of a character to recommend this plan to the executive and the engineering branches of the State government.

There is a deal of speculation in petroleum-producing districts as to the reason for the present activity of the Southern Pacific in pushing production and drilling new wells in the field controlled by the railroad and operated under the name of the Kern Trading and Oil Company, together with the fact that the Associated is increasing its storage capacity. Manager Porter, of the Associated, has been in New York most of the time since the rumor became current that the Southern Pacific was offering its interest in the Associated for sale, and the belief obtains that one of the objects of his visit is the disposition of these holdings. The Federal Government is still unsatisfied as to the validity of the oil-land titles held by the Southern Pacific, so that should the rumored disposal of the Southern Pacific interests in the Associated culminate, and the Government prove the Southern Pacific land titles invalid, there need be no further speculation as to the purpose of the railroad in getting all the oil out of the ground that is possible before the end of its valid activity in petroleum production has been reached.

Denver

July 8—The rich strike made by the Modoc Mining and Milling Company, of Cripple Creek, at the seventh level of the main shaft, in the saddle between Battle mountain and Bull hill, on the Ocean View claim, has been officially confirmed by Superintendent F. H. Frankenburg, Jr. Crosscutting east from the main Modoc vein, a new vein has been encountered northeast of the shaft and a drift 6 ft. wide has no walls in sight. A rich talc streak about 6 in. wide was found near the center of the drift containing both rusty gold and sylvanite. South of the shaft at the 950-ft. level, rich ore is being developed on the Clara vein, and the week's shipment of six cars has been ordered to the Pueblo smeltery.

At the close of the first six months of the current year, the mining industry in Gilpin county is in better condition than at the beginning of the year. More properties are being worked, more men are being employed, a greater tonnage of ore is being produced, milling practice has progressed substantially, and the general outlook indicates much improvement. The improvements in metallurgical practice in recent years have made possible the mining of a lower grade of ore than formerly. Instead of a saving of 69 to 70 per cent. of the metals, the modern mills effect a recovery of 85 to 95 per cent. of the assay value of the ore.

There is a report in circulation to the effect that the Tomboy company, of Telluride, has purchased the Montana claim and vein from the Revenue Tunnel company and this will have a tendency to reduce the size of the working force the Revenue company has been maintaining on the San Miguel side of their property.

A few days ago the State railroad commission anncunced a reduction of 25c. per ton on low-grade ore between May Day and Durango on the Rio Grande Southern. The rate is reduced from $1 to 75c. per ton. A number of reductions of this kind have been made recently in an effort to encourage the mining industry in camps where it is on a decline.

Butte

July 5—During the month of June 23,400 tons of ore were hoisted at the Pennsylvania mine of the Anaconda. In the early part of the month an average of 1050 tons per day were hoisted, but about the middle of the month this was reduced to 850 tons per day and at the end of the month a further reduction to 700 tons per day was made. The latter tonnage is being maintained at the present time with a force of 480 men employed in the underground workings and on surface. There were approximately 1200 ft. of development work done during the month, consisting of 600 ft. of drifting, 400 ft. of crosscutting and 200 ft. of raising. For the purpose of making a short and more direct route for the transporting of water from the Pennsylvania pumps to the Leonard pumps, a crosscut on the 1200-ft. level, which, for the past three months, has been advancing at the rate of 100 ft. per month from the West Colusa mine to the Pennsylvania shaft, is steadily progressing, and to save time, another crosscut has just been started from the Pennsylvania to meet this one. It is expected that the connection will be made in less than three months. A down grade of 2 ft. to 100 ft. of advance is given from the Pennsylvania to the West Colusa, to allow the water to run by gravity in an open flume. A survey has been made on the 1600-ft. level preparatory to raising the air shaft from the 1600-ft. level to the 1400-ft. level, the latter being the present depth of the air shaft.

Since the installation of compressed air for use by the Mountain View hoisting engine, its efficiency has been proved by the fact that more ore has been hoisted per day since then than ever before while steam was in use; during most of the month of June an average of 2000 tons of ore per day was hoisted, but about the last of the month the amount was cut down to between 1700 and 1800 tons, and a reduction of 100 men made in the working force. On July 2, the Chippie hoist, used in the third compartment of the main shaft for lowering men and supplies, was shut down for the purpose of making alterations in preparation for the use of compressed air with this engine. On the 1600-ft. level a station has been cut at the air shaft and a crosscut driven north over 100 ft. for development purposes. It is the intention, eventually, to cut a station on the 1600-ft. level at the main shaft and connect the stations by crosscutting, thus establishing a new level. Both the Mountain View and Pennsylvania mines are connected underground with the St. Lawrence, which has 22 exits.

Salt Lake City

July 6—Utah mines for the first half of year 1911 paid $3,239,587 in dividends, exclusive of several close corporations and numerous leasing companies, of which no report of dividends or net earnings has been made public. Some of the old dividend payers, including the Utah Consolidated, Silver King Coalition, Grand Central, Victoria and Mammoth are missing, but three new ones, the Opohongo, Cliff and Eureka Leasing have been added to the list. The dividends are divided as follows: Colorado, $120,000; Centennial-Eureka, $300,000; Daly West, $108,000; Iron Blossom, $160,000; Bingham-New Haven, $90,000; Sioux Consolidated, $59,631; Opohongo, $8700; Uncle Sam, $50,000; Utah Copper, $2,310,256; Eureka Leasing, $3000; Cliff, $30,000. The total does not include dividends paid by the United States Smelting, Refining and Mining Company of $702,020 on the common, and $1,701,152 on the preferred stock, a good portion of which result from operations in Utah.

Cobalt

July 7—For some time past, negotiations have been under way between the officials of the Grand Trunk Railway and the Ontario government to secure running rights for the Grand Trunk trains over the Temiskaming & Northern Ontario Railway. It is now understood that the agreement is practically completed and will shortly be signed by both parties. The Grand Trunk will then be enabled to run its trains direct from Toronto to Cochrane, the present terminus of the Temiskaming & Northern Ontario Railway, and the junction point with the Grand Trunk Pacific. This latter road is already completed for 94 miles east and 130 miles west of Cochrane.

Porcupine

July 7—The Porcupine railroad was officially opened on July 1, with the arrival in Porcupine of a special train carrying the members of the Temiskaming & Northern Ontaric Railway Commission, the Hon. Frank Cochrane and guests.

It now begins to look as though Gowganda might have a railroad. A few days ago a party of Temiskaming & Northern Ontario Railway surveyors went into the district for the purpose of running a survey from Gowganda to Porcupine, and passing through Sellwood where connection would be made with the Canadian Northern. Some good agricultural land has been opened up along the proposed route and there are also large areas of timber and pulpwood. Arrangements are being made to keep the parties in the field during the winter.

Forest fires have again been sweeping over the Porcupine district, and in some cases considerable damage has been done on the properties. Activities will not be retarded, however, and in fact the fires are often of advantage to the operators as they clear off the undergrowth and render prospecting easier.

A new company has been formed under the auspices of Bewick, Moreing & Co., known as the Ontario Porcupine Goldfields Development Company. This new company is practically a reorganization of the Northern Ontario Exploration Company, in which Bewick, Moreing & Co. were the principal stockholders, and the new company will take over the 50 claims purchased from the Timmins-McMartin-Dunlop Syndicate. The capitalization is £600,000, and the prospectus states that there are $435,000 in the treasury, which will provide ample working capital. The development of the properties will be under the direction of Bewick, Moreing & Company.

Toronto

July 4—Director R. W. Brock, of the Canadian Geological Survey, reports that the mining town of Frank, Alta., is in grave danger of being submerged by a landslide from Turtle mountain, owing to coal-mining operations which have weakened the northwest shoulder of the mountain. Since the landslide in 1903, which entailed considerable loss of life, the mountain has been under inspection by the Survey. Cracks have appeared in huge masses of rock, which are ascribed to the working of the coal seams at the base of the mountain. The fissures have grown larger since last year and Mr. Brock gives warning that a continuance of operations may at any moment result in another disaster.

Chihuahua

July 3—As has been anticipated for some time the exhorbitant wage demands of the common laborers have ended in strikes, which are seriously affecting the industries of the country. On June 30, the furnaces of the American Smelting and Refining Company's smeltery at Chihuahua were banked and were to have been blown-out in a few days, provided a wage agreement could not be arrived at. Should the peon laborers insist upon their unreasonable demands, the plant may be inoperative for some time, and in any event it is not likely that it will be possible to operate more than two furnaces, granting a wage settlement is arrived at, on account of the great scarcity of men. The Mapimi smeltery of the Compañia Minera de Peñoles also suspended operations for similar reasons several days earlier, and it is reported that the shutdown of the Torreon and Asarco plants is impending. The smelteries at Monterey and Aguascalientes were shut down for a day or two, but matters at those places have been adjusted.

There is also more or less unrest at the larger mining camps, notably at Santa Eulalia, Naica and Parral, and at the first is it believed that a strike is to be started soon, especially unless the smelting situation is not shortly relieved.

Oaxaca

July 2—Since the declaration of peace, business has been steadily improving in the mining districts of Oaxaca. Communication with the outside world, impossible from May 6 to June 5 on account of the partial destruction of the Mexican Southern railway, has been resumed, and ore is steadily being shipped out of the state. None of the rebel bands which occupied the Mixteca and Cuicatlan districts, entered the valley of Oaxaca, or the mining camps. There is no case on record of a foreigner having been molested or having suffered loss in this part of the republic. Alarmist reports sent to several Chicago and New York papers about the assault on mines and on the American colony in Oaxaca were ficticious. Everybody attended their own business all through the troubles as though there were no revolution. Political manifestations and parades took place without a single casualty, or destruction of property, although there were six governors in rapid succession during the first days of the month. The present provisional Maderist governor of Oaxaca and the authorities, assisted by a strong contingent of Federal troops, are entirely competent to take care of the situation. A body of some 1800 *Maderistas,* mixed with a fair proportion of outlaws, all badly armed, is being disbanded at Etla, where they have been in camp for the last three weeks, drawing contentedly their daily peso for rations. Some of the rougher elements of these troops may retain possession of arms, and take to the hills as bandits. These, of course, will have to be exterminated. The people of the central valley and adjoining sierras have never joined the campaign. The fields are tilled, and the corn is ripening. We are looking forward to peace and prosperous times, down here. Concerning actual politics, the artisan classes, and the office seekers and holders alone seem interested. The average *Oaxaqueño* really does not care who is president or who is governor, so long as the party in question will see that the district heads, or *jefes* and the local judges are honest and efficient. Probably 90 per cent. of the inhabitants of Oaxaca are pure-blooded Indians, illiterate tillers of the soil, who are no more capable of exercising a free vote than were the negroes in the South after the Rebellion. Their horizon is bounded by their town lines as far as politics go. For local issues they will fight, but for national or state issues they have no comprehension whatever, nor will they take up arms for such issues unless compelled to do so.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

A quartz outcrop yielding good assays has been found by F. A. Iverson, a prospector. The find is at Mile 194, on the line of the Copper River & Northwestern railroad.

Ellis Imperial—The company is installing a new compressor on its property at Valdez. H. E. Ellis is manager.

Arizona

Gila County

Inspiration—C. H. Repath, who is now in charge of reconstruction work at the Calumet & Arizona smeltery at Douglas, will have charge of the construction of this company's 5000-ton mill. An office for engineering headquarters has been opened at Los Angeles, where final plans for the mill will be prepared. Many of the engineers who planned and built the International smeltery at Tooele, Utah, have been retained for the Inspiration work.

Pinal County

Ray—At the mine, in caving the ore, the overburden is found to stand well. The ore is breaking clean and there has so far been no diminution of copper contents from that indicated in sampling. It has been shown that thick slices of ore can be caved; one of the stopes is being worked for more than 60 ft. The demarcation between ore and overburden is sharp and this condition facilitates maintaining the grade. Concentrates from the mill are being shipped to the American Smelting and Refining Company's plant at El Paso; since June 25 they have been reshipped to the Aguascalientes plant in Mexico, where cupriferous ores and concentrates are always in demand.

Yuma County

Clara Consolidated—The 700-ton smeltery was blown in June 19. Considerable construction work is yet to be completed. A sampling plant to enable treatment of custom ores will soon be put in commission which will materially aid small producers in the vicinity to dispose of their ores.

California

Amador County

South Eureka—It is reported that this mining company has acquired or is negotiating for the property of the Oneida, which has been closed for several years. It is equipped with a steam hoist and a 60-stamp mill, and is valuable for its ore reserves. The two properties are so situated as to be economically operated under one management.

Eldorado County

Sunrise—An example of low costs for extraction and milling has been demonstrated at this mine in Kelsey district in the last 60 days. The present workings from which the milling ore is extracted are opencuts on the vein, which carries pay ore across the breast, 15 ft. between walls and 40 ft. high from the floor to the apex. Two miners breaking down and one car man keep the 10-stamp mill supplied with ore, which is an average low grade with enough free gold to make profitable the milling of the entire orebody. The actual cost of extraction and treatment is reported to be less than 63c. per ton. Two shifts of men are sinking and drifting beyond the cut, and enough ore is blocked to keep the mill active for 2½ years.

Monterey County

Fred P. Feliz, mayor-elect of Salinas, and others, have taken a purchase option on five of the Plaskett Brothers' claims in the Los Burros district. The Bushnell company has built a good trail to its arrastre at the Green and Gold mine. The Melville Consolidated has completed nearly two miles of road, and is pushing the work on roads and trails toward Fort Brussels and the Guilded Crown mine, where an arrastre is to be built. Freight, via King City and Jolon, now costs $60 per ton; over the new road it will be reduced to $40.

Nevada County

Champion—The development work under bond for purchase, held by the North Star, was practically completed on July 1, and the indications are that the transfer will be made by July 18, the date of the expiration of the bond.

Golden Gate—A new and larger engine and two-ton skips, to displace the 1500-lb. skips, are to be installed. The three-compartment shaft, which measures 10x18 ft., is being deepened.

Northern Water and Power Company—George W. Starr, superintendent, states that the flumes will be repaired and that there will be plenty of water for the mines at Graniteville by Sept. 1, 1911.

Independence—Grading is completed and cement foundations for the new mill in course of construction. The mill is expected to be in operation in August. Drifts have been started from the shaft at 300 ft. F. A. Pearson, manager.

Holbrooke—The hoisting and pumping machinery recently installed is in operation. The 70-ft. shaft will be deepened to 100 ft. The formation indicates the coming in of an old channel. Mr. Reber is superintendent.

Sleeping Beauty—This old producer is being reopened by the owner, Walter Mueller, of San Francisco. The vein is the southern extension of the Middle Yuba, near Moores Flat. Work was suspended after the San Francisco earthquake fire, in 1906. The further successful operation of this mine will encourage the development of other lode mines in a camp that was scheduled to go out with the closing of the hydraulic mines.

Plumas County

Plumas-Eureka—This company is reported to have uncovered a body of high-grade ore in the Mohawk tunnel, near Johnsville. With other improvements the three-mile flume is to be rebuilt. The Eureka and Jamison mines are employing 120 men.

San Bernardino County

Claims covering 12,500 acres have been staked for niter and trona in T. 4 N. R. 25 E, on the Colorado river, by R. A. Dallugge, 1801 Van Ness avenue, Los Angeles, and others. A wagon road has been built, and good water developed.

Santa Clara County

El Dinero—Development on this quicksilver property, across the gulch from the New Almaden and the Guadalupe, has disclosed high-grade cinnabar deposits. John D. Mackenzie, San Jose, owner.

Shasta County

Balaklala—Only a few muckers of the 250 men employed in the mine have been retained since the filing of the stipulation in the United States Court, providing for the closing of the smeltery on July 25, at which time the smeltery crew will also be discharged. Insurance companies are said to have canceled a number of policies on property in Coram on account of the intended shutdown of the Balaklala.

Tulare County

Himalaya—This chrysoprase mine, in White River district, which was closed last fall by order of the New York own-

ers, is to be reopened. The property is in good condition for resumption of work. In 1910 this mine produced about $100,000 worth of gems.

YUBA COUNTY

Pennsylvania—J. C. Campbell, owner of this mine at Browns Valley, is negotiating for electric transmission from Hammonton to be substituted for oil fuel for power purposes. The installation of electrical power will make a large saving, as oil has to be wagon-hauled from Marysville. The inclined shaft is down 280 ft. The vein matter is about 10 ft. wide between porphyry walls.

Colorado

GUNNISON COUNTY

Mayflower—Another important strike has been made in this Bowerman district mine. In a tunnel which has been driven 425 ft. the vein was encountered at 150 ft. vertical depth. The ore is free milling and if arrangements can be made a lot of it will be tested at the mill below Bowerman.

Gray Eagle—George Brant has purchased the Gray Eagle group of three claims from Wackerly and Smith for the Gold Belt Tunnel and Transportation Company.

SAN JUAN DISTRICT

During the last ten days bills of lading have been received for almost 500 tons of milling machinery, tools, brick, lime and cement, and almost every freight train is bringing carloads of this freight, which is being unloaded at Brayton switch and transported to the Doyle Consolidated Mines Company's property as fast as teams can haul it. A force of men is at work excavating for the foundation of the plant which will resemble the Cripple Creek mills.

Humboldt—It is persistently rumored that the sale of the property is an assured fact. Last autumn a corps of engineers sampled the property. This summer a different crew have just completed a four weeks' sampling campaign. It is stated that this examination has proved satisfactory. Frederick G. Farrish has returned to Denver in company with L. Cherillion.

SUMMIT COUNTY

Banner—This placer on Iowa hill is being operated under lease this year by J. W. Roatcap and others. Recently a cleanup was made. It is said that a number of gold nuggets were recovered.

Snider—This placer in the upper portion of Swan valley is working with two hydraulic giants in the pit. For several years this property has been operated during the winter by drifting on the three to four-feet thick bedrock pay-streak.

Wilson—This company is keeping both mine and mill running steadily. The blanket vein was encountered at a depth of 1200 feet.

TELLER COUNTY

Joe Dandy—On the 500-ft. level of the Joe Dandy shaft, a shoot of ore has been opened which lies in the New Haven ground and which was the cause of much litigation, resulting in consolidation of the two companies. All of the ore comes from drifting. This shoot is considered one of the largest in the camp.

Elkton—Water is receding in the shaft at the rate of about 14 in. per week. The main shaft is now 955 ft. deep.

Girls' Leasing Company—This Boston company, of which Mary Collins is superintendent, has a prospecting permit on the Zenobia claim on Bull hill and the property is now being sampled. The girls have given up their lease on the Orpha May, after sending out two cars of milling ore.

El Paso—Operations were stopped in the Nicholls shaft a few days ago because of the opening of a pocket of water, which has now escaped, and the sinking has been resumed.

Indiana

BLACKFORD COUNTY

The high-grade petroleum fields show an increase in the completed well column, while in new production there is a slight falling off, on account of the scarcity of gushers. Five wells were completed in the Blackford field during the week and and all are fair producers.

CLAY COUNTY

A Chicago company has purchased a body of coal land near Hausertown, on the New Monon railroad, eight miles east of Clay City, and will proceed to get out the coal by stripping or removing the surface covering, an average of 7 ft. in depth, by means of steam shovels. The thickness of the coal deposit is 4 ft. This plan of coal mining is new in Indiana.

Bessemer Block Coal Company—This company, of Clay City, has been incorporated to do coal-mining business in the Block Coal district. A new mine shaft will be sunk and other developments made by the company. The incorporators are Williard E. Mogg, J. F. Pitts and H. F. Cooke.

GREENE COUNTY

The first-aid teams of the Linton district are making preparations to attend and participate in the first national meet in Pittsburg, Sept. 16, under the direction of the Bureau of Mines.

Greene County Collieries Company—This company, recently incorporated with large capital, has begun work on property near Midland. New shafts will be sunk, buildings reërected and new switch and loading facilities built.

Michigan

COPPER

Hancock—This company stamped 5998 tons of rock during the month of June, yielding 19.45 lb. copper per ton of rock.

Old Colony—The drilling outfit has been delivered at the property and operations are to start at once.

Mohawk—At No. 6 shaft, the rock engine house and boiler house have been completed and are ready to receive the permanent equipment. Rock shipments of about 300 tons per day are being forwarded to the mill.

Adventure—The crosscut being driven from the shaft to cut the three lodes, found by drills, has been advanced about 80 ft. and is within a short distance of the point at which the first lode of the series should be encountered.

Calumet & Hecla—The company is preparing plans for the erection of another large regrinding mill to be built at Lake Linden, in proximity to the stamp mills. The purpose of the plant is to retreat the tailings.

Missouri

Point Milling and Manufacturing Company—This company owns 300 acres of land containing barytes, which heretofore has been mined by hand. A steam shovel of capacity for about 600 cu.yd. per day has just been installed. The company is planning to remodel and improve its process of manufacture, and is now investigating machinery for washing, grinding, bleaching and drying a high grade of barytes. J. W. Wood, superintendent, Mineral Point, Mo., states that he is in the market for machinery that will increase capacity or lessen cost of production.

Mokas—The company has struck ore on the Leonard land at Chitwood, which contains the Old Superior mine. W. F. Pate is superintendent.

Gager—The mill has been completed on the Jubilee ground at Lehigh.

Rusk Land—The Big Irishman and the Little Israelite companies, at Thoms Station, have each contracted for the erection of mills. R. L. McFann, Sapulpa, Okla., is manager.

Dixie—The first run of ore made by this company, at Prosperity, returned 46 tons of ore in 8½ hours.

High Tariff—This company, at Thoms Station, has struck lead ore in its drifts. Elmer Tabor, Joplin, is manager.

Montana

BUTTE DISTRICT

North Butte—On the 2400-ft. level of the Speculator mine, the west drift on the Edith May vein has been driven over half of the distance between the east and west fault plane, showing a better grade of ore than was encountered in the lean

zone on the 2200- and 2300-ft. levels on this vein. The veins encountered in the north territory have been found to be richer in silver as depth is attained, and a drift on one of them has developed ore averaging from 1 ft. to 1.5 ft. wide, the ore running 14 per cent. copper and 32 oz. of silver per ton. The shaft will soon reach the 2800-ft. level, and station cutting will then be commenced on that level, and on the 2600-ft. level. Following this, crosscutting will be started to the Jessie vein and beyond, to tap the veins on the north, and since the Jessie vein dips toward the shaft with depth, the crosscut on the 2800-ft. level will probably reach the vein before that on the level above. Special effort is to be made to crosscut at once on the 2800-ft. level to the new vein cut by the Speculator shaft at the 2750-ft. level, as it is thought that this will prove to be an addition to the ore reserves.

BROADWATER COUNTY

Irish Syndicate—This group of four claims, located in the Beaver Creek district, near Winston, is being operated by Albert Kleinschmidt, who is making arrangements to haul his ore to Winston for shipment to the East Helena smeltery. The property contains a narrow vein of silver-lead ore, which was worked from a shaft before the shutdown of some years ago. The present management has decided to drive a tunnel to the orebody, as the mine is full of water and the shaft timbering defective. This tunnel, which has now been driven on the lead for a distance of 400 ft., gives a vertical depth of about the same distance. When the pay streak was first encountered it was 4 in. wide but it has since widened to 8 in. Three cars of this ore are now on the dump awaiting shipment.

LEWIS & CLARK COUNTY

Drumlummon—At this mine, in the old camp of Marysville, a force of men is at work unwatering the property and renovating the 60-stamp mill in preparation for mining operations this summer. As soon as the water is pumped out an addition to the crew will be made and mining started. The St. Louis Mining and Milling Company now has charge of the Drumlummon mine as the result of a suit recently settled in its favor.

East Helena Smeltery—According to the report of F. M. Smith, manager, between 9000 and 10,000 tons of ore and concentrates from the Cœur d'Alene district in Idaho are being smelted per month. The smeltery is operating three stacks with a capacity of 600 tons per day. The supply of custom ore is about normal. Some of the ore from the Ohio Keating and Black Friday mines at Radersburg has been handled there lately; also some tonnage is being handled from the Elkhorn mine at Elkhorn, and from the Neihart district.

Emma—B. W. Phillips, of Rimini, owner of a half interest in this group of seven gold claims in that district, has bought the remaining half-interest from C. B. Power, of Helena, and will leave for St. Paul and New York to finance the proposition. On the central claim a tunnel has been driven 420 ft., and a shaft raised from the end, 53 ft. to the surface. A crosscut has also been driven north 54 ft., cutting the vein of one of the outer claims. Plans are being made to erect a mill either at Hauser lake or on the Big Blackfoot, and for building an electric line for transporting the ore to the mill.

Buffalo—A force of 12 men is now employed in developing and mining work at this mine in the Rimini district. The ore contains gold, silver and lead, some of it being high grade. There is a tunnel on the property 300 ft. in length, from the end of which a shaft has been raised 45 ft. to the surface.

Valley Ford—The mine has produced about $300,000 up to the present time, and still has ore in sight. A force of four men is now employed.

MADISON COUNTY

Nellie Bly—James E. Murray, a Butte lawyer, treasurer of the Alder Gulch Exploration Company, in company with James Davidson, a stockholder, has just made a trip of inspection to the mine in Alder gulch, four miles from Virginia City. The erection of a stamp mill is contemplated. In addition to this the company has a lease and bond on the St. John group and the Butcher Gulch placer, and it is the intention to reorganize and incorporate with a number of Butte men among the stockholders, and to begin operations as soon as possible. All of these properties have produced gold ore, and some is on the dump at present, awaiting the erection of a mill.

Nevada

STOREY COUNTY

Mexican—The ore taken from the mine during the month of June had a gross assay value of $98,000, and the net cash returns on ore shipped to the smeltery were $50,749. Seventeen railroad cars of first-class ore were shipped for treatment. Development work in the vein for the month, included the extending of raises on the 2300- and 2400-ft. levels, and drifting north in the ore for 50 ft. on the 2500-ft. level with crosscuts east and west.

Ophir—The ore extracted during June was 956 tons, worth $39,000. Partial returns on 2000 tons of ore milled at the Kinkead mill, indicate that the cash returns on the run will be in excess of $60,000. This is $20,000 above the returns of the previous run. Development work for the month was principally on the 2500-ft. level, which included a south drift driven 90 ft. in the vein. The assays show that the ore is improving as work proceeds south.

Con Virginia—Stoping was discontinued on the 1750 level temporarily. Prospecting for the month on the 2450- and 2500-ft. levels has developed strong vein formations, which are being followed to the east and west.

Union Consolidated—Crosscutting on the south line of the mine has exposed a vein 40 ft. wide, all of which is milling ore.

C. & C. Shaft—The old sump below the 2650 station was cleaned for a depth of 17 feet.

Ward Shaft—Hot water was tapped on the 2000 level, and is being slowly drained through the bulkhead, and pumped to the Sutro tunnel.

New Mexico

SOCORRO COUNTY

American Zinc—A crosscut tunnel is being driven, starting near the center of the Linchburg No. 4 lode, and about 150 ft. north of its south line. The course of the tunnel is about due east. At present it is about 600 ft. under cover, and it is expected that the first fault will be cut within the next 50 feet.

Germany—This tunnel, situated about 1800 ft. east of the town of Kelly, recently cut a body of sulphide ore about three feet thick. A drift 200 ft. long on this body, shows ore in the face.

Graphic—The average of several assays of sulphide ore, representing about 280,000 lb., showed, per ton, 23.4 per cent. zinc, 12.8 per cent. lead, 1.6 per cent. iron, 2 per cent. copper, 16.7 per cent. silica, 2 oz. silver and a trace of gold.

Oregon

JOSEPHINE COUNTY

Gold Note—The new stamp mill is now working on good ore and is making a satisfactory showing. H. B. Hendricks, Grants Pass, is manager.

Waldo Consolidated—The company expects to spend considerable money, this year, for hydraulic equipment on its several properties. Frank Leland, Grants Pass, has charge.

South Carolina

Haile—In the issue of the JOURNAL, July 1, it was stated that a tract of 1900 acres in Lancaster county had been sold to John T. Stevens, and that development would soon start on the property which was worked as a gold placer several years ago. As a matter of fact, the Haile gold mine, a well known property at one time and comprising 1805 acres, was sold at public auction and was bid in by John T. Stevens, of Kershaw. It is presumed that active work will commence after the title has passed into the hands of the purchasers.

South Dakota

Black Hills District

Homestake—Work on the hydroelectric plant on Spearfish creek is progressing satisfactorily, and present indications are that it will be ready to run Sept. 1. All machinery equipment has been delivered and is being installed. The work on the concrete lining of the tunnel is being rushed and the intake dam is completed.

Castle Creek—The dredge at Mystic has just completed a 30-day test run. A capacity of 2000 cu.yd. per day was maintained and it is said that the cleanup was satisfactory.

Utah

Beaver County

Majestic—After installing pumping equipment some months ago at this company's Harrington-Hickory property, the shaft was sunk from the 500 to the 600 level, and on the 600 drifting to the east has been done for several hundred feet. On June 27, 4 ft. of silver-lead ore were cut in the Harrington fissure, which assayed 10.8 per cent. lead and 117.46 oz. silver. A part of the ore runs 30 per cent. lead and up to 389 oz. silver. The strike being 100 ft. below the water level is regarded as important. Two additional fissures running parallel to the Harrington vein will soon be reached by development work on the 600 level.

South Utah—During May, 24,019 tons of ore were milled and produced 2223 tons of concentrates. These carried 318,350 lb. copper, 2851 oz. silver, and 140 oz. gold. The silver contents are the highest since the company began operations last October. During the month the north side of the mill was closed down for two weeks to install Janney classifiers. About 700 tons were milled daily, which it is expected will be increased to 1000 tons when the changes in progress are completed.

Utah Mining, Milling and Transportation—The two-compartment shaft on the Lady Bryan group has reached a depth of 400 ft. and ore has been opened by drifting on the second, third and fourth levels. Shipments of about two cars per week are being made, though according to Superintendent Thompson, more attention is being paid to development than to mining. The ore carries an excess of iron, and from 16 to 30 oz. in silver, with varying amounts of copper.

Utah United—Sinking at this property in the Beaver Lake district has been delayed on account of retimbering the shaft from the 100 to the 300-ft. level. Sinking from the 450 level will be resumed soon and it is expected that the 500 will be reached by the middle of August, when drifting for the vein will be started.

Cedar-Talisman—The north drift on the 500 level is being extended and is near a point under the old Stalwart workings, about 150 ft. below the bottom of the old shaft. The east drift on the 500 is being driven for the contact between limestone and quartzite. Development only is in progress and no attempt at stoping is being made. Ore is exposed on the 400 level.

Juab County

Tintic shipments for the week ended June 30 show an increase over the last few weeks. The total amounted to 184 carloads, as compared to 148 cars for the week previous. The Centennial Eureka shipped the largest tonnage, with the Iron Blossom second and Dragon Iron third. The list includes shipments by leasers from the Black Jack and Swansea.

Iron Blossom—Eighty tons of ore daily are being raised from the No. 3 shaft, while a larger tonnage is coming from shaft No. 1. Another cave has been encountered on the 500 level of the No. 3 workings which contains silver-lead ore. The cave was cut in drifting south on the 500 level and shows boulders of lead ore throughout the explored part, with some lead ore in the roof. Three feet of copper ore are being followed on the 600 level of the No. 1 shaft. According to report, a new hoist of large capacity has been ordered for these workings.

East Tintic Development—Small streaks and bunches of galena ore have been followed by leasers on the 100 and 300 levels. A car from this work is ready for shipment.

Salt Lake County

Utah Consolidated—The body of copper ore on the 10th level is reported to be opening up well. Some of this ore runs 6 per cent copper. The lead ore, opened in the section toward the Yampa property, has been driven on for some distance, and shipments have already been made to the International.

Columbus Consolidated—Good progress is being made in unwatering this property, the water being below the 200-ft. level. At the recent annual meeting a new board of directors was elected. C. H. Gibbs succeeds Tony Jacobson as manager.

Utah Apex—Shipments of 155 tons of first-class ore are being made daily, the average value of which is about $10 a ton. Milling operations have been resumed, after a shutdown of eight months, during which time attention was given to development. One shift is being worked, and is handling 60 tons per day, which will be increased to 175 tons. It is planned to make a trial installation of Richards-Janney classifiers, as soon as possible. The mill ore comes in part from the edges of the new body of shipping ore, but largely from the upper levels. It is expected to have the mill running at full capacity by July 1. Arrangements have been made with the Bingham & Garfield railroad, which is building a spur to the mouth of the main Parvenue tunnel. When this is completed, the railroad facilities of the mine will be the equal of any in the district, and a saving in freight rates and additional convenience in handling ore will result. Shipments during May netted the company over $15,000 and the earnings for June are expected to reach $20,000.

Tooele County

Consolidated Mercur—A shipment of gold bullion made recently to the United States Assay Office was valued at about $45,000. Between 21,000 and 23,000 tons of ore were treated to secure this yield.

Bullion Coalition—Several leasers on the old Honorine property at Stockton are mining ore on different levels above the tunnel and making regular shipments. A fair royalty is being received by the company from these operations. There are about 25 leasers, who are reported to be taking out 275 tons, per month, of ore which will run from 25 to 28 per cent. lead, and from 20 to 30 oz. silver with some gold, 35 men are employed on company account. The main tunnel is in about 7000 ft., and furnishes a flow of 2000 gal. of water per minute.

Susanna—This property is being operated under lease by H. Martin, who is reported to be milling ore from the lower tunnel, and to be making some shipments of gold bullion.

Queen of Sheba—This property on Ibapah mountain in the Deep Creek district is driving its lower tunnel, which is in 865 ft. The objective point is an old shaft, from which some good gold ore is said to have been mined.

Washington

Okanogan County

Cain Gold—A force of men is to be put to work on this property near Chesaw, and machinery will be installed as soon as conditions warrant. Charles Cain is superintendent.

Stevens County

Pacific Copper—The company, which is controlled by Millard S. and Milburn E. Hosea, of Spokane, is considering the installation of a stamp mill.

Blue Star—Operations have been resumed at this mine and regular shipments will now be made to the Tacoma smeltery. Mark Mitchell, Chewelah, is manager.

Wisconsin

Hinkle—The mine is developing into a regular shipper and underground developments are reported to be satisfactory.

Mound City—The company recently lost its mill by fire. The loss was about $15,000 and only partially insured.

Empire—This mine at Platteville, the oldest dividend payer in the district, is producing a car of concentrates per day.

Cleveland—The mine at Hazel Green is employing about 40 men and is producing some good ore. Developments are satisfactory.

Peaceful Valley—A motor truck is now being used to haul the ore from this mine. It has replaced six teams and reduced the haulage cost from 60 to 15c. per ton.

Benton Mill—This separating mill is nearing completion and buyers have been sent into the field to secure low-grade ore.

Canada

British Columbia

Consolidated Mining and Smelting—During the month of May this company received at its smeltery at Trail, 26,186 tons, and smelted 29,000 tons of ore. The total gross value of the output was approximately $387,400, of which 63 per cent. was in gold. The aggregate value of metals produced during the first 11 months of the company's fiscal year, which ends July 1, is about $4,095,000, which gives a monthly average gross value of $372,273 as against $492,647 for the previous fiscal year, or a decrease of nearly 25 per cent.

Britannia Mining and Smelting—Good reports come from Britannia Beach, in vicinity of which this company is working deposits of low-grade copper ore. It is stated that more than 300 men are employed in mine and concentrating mill, that better grade ore has been found, and that output of concentrate has considerably increased.

Portland Canal—The Portland Canal Short Line Railway Company has laid steel to the Portland Canal Mining Company's concentrating mill, giving railway connection with tidewater at Stewart. Additions are being made to mill plant. Manager Elmendorf reports ore assaying up to $51 in gold and silver, in the winze from Bell drift, No. 2 level.

Nicola Valley Coal and Coke—A contract has been let to the Roberts & Schaefer Company, Chicago, for the erection and equipment of a new tipple and coal washery at the company's Middleboro colliery, Nicola valley. Other new plant and coal-handling facilities are being added. The Sullivan Machinery Company has contracted to do 4000 ft. of diamond drilling on the property, and a rock tunnel, already 400 ft. long, is being driven a total length of 790 ft. to connect No. 4 and 5 mines.

Nova Scotia

Dominion Steel—A railway four miles in length is being built from Morein Junction to the company's new colliery, No. 20, at Birch Cove As soon as transportation is secured development will be rapidly pushed and a new slope sunk about 2000 ft. south of the present one. The coal of this mine is of the best quality and it is expected that shipments will be made before the close of navigation.

Ontario—Cobalt

The shipments from Cobalt for the week ended June 30 were: Nipissing, 306,247 lb.; McKinley-Darragh, 174,575; Cobalt Lake, 145,760; La Rose, 131,344; Chambers-Ferland, 64,000; Right of Way, 63,388; Beaver, 62,500; Kerr Lake, 60,050; Coniagas, 58,030; total, 1,065,894 pounds.

Ophir—A good find of silver has been made on the 300-ft. level of this property.

Cobalt Central—The property has been sold to Philadelphia men for $100,001. The liquidator had placed a reserve bid of $100,000 on it.

Wettlaufer—The management of this South Lorrain property has decided to install a 10-stamp mill to treat the low-grade ores.

Buffalo—The mill report for May shows that 3355 tons of ore, averaging 37 oz. of silver per ton, were treated, and that 104,255 ounces were recovered at a total cost of $4925. Extensions are being made to the cyanide plant, which necessitate its being closed down for the present.

McKinley-Darragh—Statement of conditions, as of June 15, shows: Cash on hand, $383,024; ore at smelteries, $115,600; ore at mine ready to ship, $38,500; total, $537,124; silver produced since Jan. 1, 1,160,000 ounces.

Powerful Mines—A surface discovery of silver has been made on this Gowganda property.

Ontario—Lake of the Woods

Scramble—Buffalo and New York men have purchased this mine. The property has a 65-ft. vein that has been traced for 3000 ft., but the ore is low grade, although high assays of gold have been obtained in places.

Ontario—Porcupine

Apex—A shot drill will be installed on this property to prospect the veins at depth.

Success—Work is to be started on the property which was recently purchased for an English syndicate.

North Dome—Another discovery of a vein, carrying free gold, has been made.

Gibbons—These properties in Shaw township have been sold to an English syndicate.

La Palme—A showing of free gold has been found on this property.

Imperial—The main vein on this property has been cut at the 100-ft. level.

Foley-O'Brien—Some good ore is now being taken from this property.

Crawford—Development work will be started at once. The property belongs to a Philadelphia company.

Gold Reef—Satisfactory assays are reported from this property.

Dome—It is stated that the company will start operating 20 stamps about August 1.

Miller—A discovery of free gold has been made on the surface of this property, which is situated in the Swastika district.

Lucky Cross—Good gold ore has lately been found on this Swastika property.

Mexico

Chihuahua

Socorro—J. W. Pender states that this property, which has been closed for several months due to the impossibility of securing supplies during the Mexican revolution, will soon resume operations.

Galvanista Gold Mining Company—This property in the Guadalupe y Calvo district continued development work unimpeded throughout the recent revolution. About 100 men are employed.

Oaxaca

Cubilete—This property has been sold to a new mining and milling company in which Percy A. Babb, Maurice Clark and others have capitalized at 400,000 pesos. It is proposed to extend development work and then build a mill at the foot of Cubilete hill for treating the ore from this and neighboring mines.

Escuadra—This property is now being examined for people who have secured an option of purchase.

San Juan—This mine is still producing the bonanza ore upon which mining was begun some time ago.

Sanford—This property of the San Geronimo Mining Company is being developed with highly satisfactory results. The company now owns the San Rafael mine.

Natividad—In this mine, owned by the Mimiaga estate, a vein was cut on the 300 level; the ore is good but the great influx of water forces suspension of work for the present.

Sonora

Greene-Cananea—The production for June was 3,462,000 lb. of copper, 102,606 oz. of silver and 509 oz. of gold.

Asia

Korea

Oriental Consolidated—Official advices have been received that the June cleanup amounted to $104,550. The results for April show that 240 stamps in 28.9 days crushed 29,588 tons which yielded $146,085 gross and net $69,727. Operating expenses were $76,252, and $105 were expended in improvements and development work.

The Markets

Coal Trade Review

New York, July 12—Coal trade in the West does not show much change from the last report. Most mines are still running at about 60 per cent. of capacity. Only a few are able to make full time and those have special contracts or some special grade of coal. There are threats of a general strike in Indiana as the result of differences over the interpetation of the wage contract.

Coal trade in the East is improving, though there have been some delays in the all-rail trade from the mines. Coastwise business is rather slow.

The anthracite trade is good. The June production from the mines was unusually large, but most of it has been readily taken.

Rates on Anthracite—In the case of Meeker & Co., against the Lehigh Valley Railroad Company, the Intersta Commerce Commission finds that the rates from the Wyoming region to Tidewater at Perth Amboy—which are $1.55 per long ton on prepared sizes, $1.40 on pea and $1.20 on buckwheat coal—are unreasonable so far as they exceed $1.40 on prepared sizes, $1.30 on pea and $1.15 on buckwheat. The commission is also of opinion that reparation should be awarded on the basis of the rate now found to be reasonable on all shipments of coal made by the complainants to Perth Amboy since Aug. 1, 1901. Further hearings will be necessary to fix the amount to be repaid.

The Lehigh Valley Suit—Notice of suit against the Lehigh Valley Railroad Company has been filed on the part of the Government. The charge is violation of the commodities clause of the Interstate Commerce act. It is alleged that coal carried over the road really belongs to the railroad company; the Lehigh Valley Coal Company and its subsidiaries being only subterfuges to avoid the law, as they are really owned by the railroad company. This is a test case in proceedings against the anthracite companies.

Coal Traffic Notes

Anthracite shipments by Lake from Buffalo for the season to July 1 were 1,357,270 tons in 1910, and 1,195,735 in 1911; decrease this year, 161,535 tons, or 11.9 per cent. The larger shipments this year were 394,775 tons to Chicago; 325,850 to Duluth and Superior; 171,900 to Milwaukee; 100,220 to Fort William and Port Arthur, Canada.

Coal shipments originating on lines of Southern railway four months ended April 30 were: Tennessee district, 389,370; Alabama district 871,362; total, 1,260,732 short tons, a decrease of 144,806 tons, or 10.3 per cent. from last year.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal passing through Sault Ste. Marie canals season to July 1 short tons:

	1910	1911	Changes
Anthracite	642,670	520,000	D. 122,670
Bituminous	3,350,029	3,689,282	I. 339,253
Total	3,992,699	4,209,282	I. 216,583

Total increase this year 5.4 per cent. The decrease in anthracite is notable.

Anthracite shipments from the mines in June were 6,215,327 long tons. This is the heaviest tonnage ever reported in June; it is 102,025 tons less than in May, but 817,204 tons more than in June, 1910. For the six months ended June 30 the shipments were, in long tons:

	1910	1911	Changes
Reading	6,379,315	6,670,836	I. 291,521
Lehigh Valley	5,809,040	6,438,812	I. 629,772
N. J. Central	4,268,219	4,669,591	I. 401,372
Lackawanna	4,919,411	4,837,234	D. 82,177
Del. & Hudson	3,284,620	3,650,719	I. 366,099
Pennsylvania	3,140,019	3,345,729	I. 205,710
Erie	3,643,007	4,378,386	I. 735,379
N. Y., Ont. & West.	1,371,117	1,318,276	D. 52,841
Total	32,814,748	35,309,583	I. 2,494,835

Total increase this year, 7.6 per cent.

The Delaware, Lackawanna & Western and the New York, Ontario & Western had small decreases; all the other companies gained in tonnage; the Erie and the Lehigh Valley having the larger increases.

New York

Anthracite

July 12—Trade is begining to revive a little; it was practically dead for a week over the holidays. Most of the collieries were shut down for a week, but the time can well be spared after the big output in June.

Schedule prices for July are: $4.55 for lump, $4.80 for egg and stove, and $5.05 for chestnut; all f.o.b. New York harbor. On steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.30@2.75; No. 2, buckwheat or rice, $1.80@2.25; barley, $1.45@1.70; all according to quality, f.o.b. New York harbor.

Bituminous

Harbor trade has shown a little activity after the slow business of the holiday week. Dealers are looking forward to better trade, but at present orders come in irregularly. Coastwise trade is steadier and seems to be improving; while all-rail business is better. Some large consumers have made no contracts, and they may make the spot market more interesting after a time. The Lake trade is still taking coal.

Prices do not show any material change. A good Miller vein steam coal costs $2.50, f.o.b. New York harbor; lower grades sell down to $2.30 and better up to $2.85. Gas coals bring $1.10@1.15 for ¾ in., $1@1.05 for run-of-mine, and 70@80c. for slack, all at mines.

In the coastwise trade vessels are plenty and rates inclined to be weaker, but there has been no actual change. Going rates from New York are 55@60c. to Boston and Portland, with 5 or 10c. added to the shoalwater ports; 35c. to Providence and Fall River; 25c. to Sound ports. From Philadelphia to Boston and Portland tonnage can be had at 60@65c. From Norfolk to Boston 60@70c. is charged.

The Bureau of Accounts of the Public Service Commission reports the quantity of fuel used by the gas companies in Manhattan and Bronx boroughs of New York city in 1910 as follows, in short tons:

Coal used as fuel	299,598
Coke used as fuel	168,833
Total boiler feed, etc	468,431
Coal carbonized	580,039
Coke made	400,495

The reports of coke made as a byproduct are not quite complete.

Birmingham

July 10—A general resumption of coal operations in Alabama is looked for in August. Some of the larger corporations have contracts on hand now besides their own probable needs. Commercial coal companies are beginning to receive orders that promise to require a large tonnage to supply. Coke is in better demand and the production is picking up.

Some of the larger railroad interests in the South have placed their orders for fuel. Sales agents of the various coal companies in this territory have been busy for some weeks now and report that plenty of orders are on hand.

The work on the by-product coke ovens being erected by the Tennessee company is being pushed.

Chicago

July 10—Sales of coal, both wholesale and retail, are very light in the presence of continued hot weather. The trade is inclined to wait, in city and country, for evidences of the need of

coal, while manufacturing is at a low ebb because of the weather and the general slackness of business. The chief demand is for western screenings, at $1.65@1.85, with run-of-mine occasionally selling at $1.65@1.80 and lump at $1.80 @2.25. These are car prices on Illinois and Indiana coals, which are being sent lightly from the mines, so that there is little surplus on tracks.

For coals from east of Indiana there is a small market, notwithstanding strenuous efforts in the retail trade to dispose of smokeless at cut prices. The average summer consumer of coal does not care for much else than western screenings, though for autumn use he will now and then buy liberally. Smokeless run-of-mine brings 90c. @$1 at the mines, or $2.95@3.05 Chicago, and lump $3.55 Chicago. Hocking has a light market at $3.15 or slightly less, and receipts are well kept down to actual needs. The anthracite market is hardly in evidence, sales being very light.

Cleveland

July 10—The Lake coal movement is steady, and rather better than it has been. Plenty of large vessels are to be had, but there is rather a scarcity of small boats.

Local trade is quiet, chiefly on account of the hot spell of the past week. Otherwise it is in fair condition and the tone of the market is good. Prices are unchanged. Slack is in large supply.

Indianapolis

July 10—For some reason the miners of the Block Coal district for the past two weeks have had almost steady work. Coming at this, the dullest season of the year, the change is a welcome one, both to the miner and the operator. It is authoritatively stated that part of the revival is due to preparations being made for the threshing season now opening in Indiana, Illinois and the great western wheat-producing States. Orders of a most unexpected nature, and from an equally unexpected source, have been coming into the different coal companies of the block district and they are rushing things at the mines. Local operators say that the possible strike in the bituminous field, which threatens to become State wide, will not affect the block field. This district is entirely separate and distinct.

There is little or no change in conditions or outlook in the bituminous field. The most prominent operators are saying that they do not expect a general resumption of the coal-mining business for a matter of six weeks yet, but that they do look for an exceptionally good season's business when it once opens. There is a general feeling over the country that this is going to be the case. There is, however, considerable apprehension regarding a strike that is threatening in this State. After repeated efforts in conferences, lasting all week, the miners and operators failed to agree on the interpretation of their contract and the miners took the matter before the executive board of the National Mine Workers where the stand taken by the miners was fully approved. The question in dispute is whether the contract covers the number of places that shall be provided for men assigned to removing pillars after the bulk of the vein has been removed. There is trouble also over the alleged action of the operators in refusing to withhold from the pay of miners certain assessments for the organization. President Van Horn, of the Indiana Miners' Association, says there is no better time than now to settle the differences.

Pittsburg

July 11—Shipments of coal by the Pittsburg district in the half year just ended are estimated by a competent authority at 40 per cent. of the shipments during the whole of last year, but shipments for the second half of this year are forecasted at fully 60 per cent. of last year's total, which would make this year at least as good as last year from a tonnage standpoint. The market is quiet this week. Lake shipments are increasing, but local demand is very light. Prices are a trifle firmer, there being few departures from the regular price of $1.15 for mine-run, but $1.10 is sometimes done on nut. We advance minimum quotations slightly and quote as follows: Nut, $1.10@1.15; mine-run, $1.15; ¾-in., $1.25; 1¼-in., $1.35; slack, 60@75c. per ton at mine.

Connellsville Coke — Purchases of prompt furnace coke in the open market to meet the shortage of a prominent producer and consumer have ceased, and this, with the better shipments this week after the reduction last week due to the holiday and its consequences, has produced lower prices on prompt furnace coke by 10 to 15c. a ton. Otherwise the market is unchanged. No contracts of consequence have been placed. We quote: Prompt furnace, $1.40@1.45; contracts, second half, $1.65@1.70; prompt foundry, $1.90@2; contract foundry, $2@2.25 at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended July 1 at 275,950 tons, a gain of 2500 tons, and shipments at 3340 cars to Pittsburg, 4584 cars to points west and 535 cars to points east, a total of 8564 cars.

St. Louis

July 10—The continued intense heat has affected the coal market and very little business has been done. Many industrial plants were closed down on account of the heat, taking off more or less business for the time being.

As anticipated, there was little work done at the mines last week, the holiday stoppage at many of them being continued all the week. Most of the coal coming in for some time past has been from the Fifth and Ninth districts in Illinois, but a little more is now coming from the Cartersville district. Standard is practically out of the market.

Screenings are less in demand, many of the plants using that class of coal being shut down for the present. There is a little more demand from country dealers, and lump is relatively stronger than small coal. Except for this weakness in screenings, prices are unchanged.

Anthracite—The market is quiet, and likely to remain so through July. A good deal of anthracite is still moving on June orders.

FOREIGN·COAL·TRADE

Far Eastern Coal Trade—Receipts of coal at three leading ports in the Far East in 1910 are reported as below, in long tons:

	Shanghai	Hong Kong	Singapore
Japanese.....	734,254	890,510	282,730
Chinese.....	256,501	128,520	11,828
Australian.....	4,901	10,500	72,114
Indo-China....	20,077	100,250	.....
Others.....	16,526	76,298	151,132
Total.....	1,032,259	1,206,178	517,804

This shows the strong position of Japan in the trade. Chinese coal has shown large gains in the past two years, and Australian heavy losses. Other receipts at Singapore include 103,225 tons from India.

Welsh Coal Prices—Messrs, Hull, Blyth & Co., London and Cardiff, report prices of coal on June 30, as follows: Best Welsh steam coal, $4.56; seconds, $4.20; dry coals, $3.84; best Monmouthshire, $3.84; thirds, $3.96; seconds, $3.66; best small steam coal, $2.64; seconds, $2.28. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, July 12—Notwithstanding the midsummer season and the intense heat which has prevailed all over the Eastern part of the country the iron and steel trades are showing a better tendency. Developments are encouraging to those who look for a better business in the second half of the year than the first has been able to show. The crop reports are generally good, indicating that there will be money to use for construction later.

In pig iron sales have been better and inquiries are coming in quite freely. Prices do not improve, but that is hardly to be expected while unsold stocks are still large and many furnaces are idle.

In finished material orders are coming in and specifications on contracts are good. Railroad orders for equipment and material are larger, and more work is going to the rail mills. Structural steel is quiet just now, but some important contracts are in prospect.

There are some good orders for export in sight. Among these is one for 1000 tons of steel wire for the Philippines.

Steel Corporation Orders—The statement of unfilled orders on the books of the United States Steel Corporation on June 30 shows a total of 3,361,058 tons. This is an increase of 247,871 tons over May 31; the first month this year in which an increase has been shown.

The increase is unfilled orders of the Steel Corporation during June, 247,871 tons, was larger than was expected. An increase was looked for, but as shipments were considerably larger than in May the increase in unfilled business was not expected to prove very large. There were decreases throughout 1910, then increases in January, February and March, with decreases in April and May, whereby the unfilled orders June 30 are only 83,000 tons short of the maximum reported for this year, which was for March 31. July promises to show a further gain, as one of the leading constituents of the corporation reports its bookings to have made a material gain over shipments during the first week of this month.

Pig-Iron Production—The returns of the blast furnaces, as collected and published by the *Iron Age* show that on July 1 there were 197 coke and anthracite furnaces in blast, having a total daily capacity of 60,000 tons; a decrease of 1850 tons from June 1. Making allowances for the charcoal furnaces, the estimated production of pig iron in June was 1,816,500 tons, or 106,000 tons less than in May. For the six months ended June 30 it was 11,632,700 tons.

Baltimore

July 10—Imports for the week included 4405 tons iron pyrites from Huelva, Spain; 11,450 tons iron ore from Cuba. Exports included 309,240 lb. scrap tin to Rotterdam; 201,300 lb. zinc dross and 1,123,800 lb. steel billets to Liverpool; 269,739 lb. structural steel, 1,120,600 lb. steel rails and 105,900 lb. rail joints to Puerto Barrios; 9,156,830 lb. steel rails and 686,109 lb. of rail joints to Mexico; 5,730,256 lb. structural steel and 1,493,597 lb. miscellaneous iron and steel to Panama.

Birmingham

July 10—Southern manufacturers of pig iron are making sales of their product but the market is far from being active. The price at which the iron is being sold is low, $10 per ton, No. 2 foundry, being quoted right along. There will hardly be any improvement in the make in the Southern territory until demand picks up and much of the accumulated iron on the yards has been moved. The Tennessee company has several furnaces at work on basic iron and but one on foundry iron. The Sloss-Sheffield company, the second largest iron-making company in the South, is in position to start up one or two furnaces within a short time when demand warrants it. The Republic Company has three furnaces in operation and the statement is made that the selling is equal to the production.

Alabama manufactured 123,417 tons of iron in June, against 131,804 tons in May and 158,869 in June, 1910. For the first half of this year Alabama produced 796,556 tons of iron against 998,903 tons last year.

At the steel plant of the Tennessee company at Ensley there is a busy condition on all sides. The Southern Iron and Steel Company is filling all orders for steel rod, wire and nails from its warehouses at Gadsden right along while repairs are being made on the mills.

Some few sales of charcoal iron were made recently, the price being held at $22.50 per ton. It is understood that some healthy orders for charcoal iron are in sight.

Chicago

July 11—The pig-iron market, like most other markets, has languished under the influence of the extremely hot weather. There is little disposition to contract heavily for last-half iron anywhere, though inquiries are numerous for large tonnage. Reduced production has firmed local irons greatly, and furnace agents stand pat at $15 for No. 2. Southern is quoted at $10@10.25, Birmingham, on actual sales, which means $14.35@14.60, Chicago, and a few sales have been above the 500-ton mark. It is evident that melters are prepared to buy heavily on the first indication that the market is swinging upward, but "overproduction" is still the cry among them. Selling agents profess their belief that the summer dullness will be followed by an extraordinary revival in the early autumn. In general business conditions there seems much to justify this conclusion. Sales of structural materials are large and many important contracts are pending; railroad supplies are quiet; other lines show activity or firmness. Some pig-iron users seem prepared to contract for first-quarter supplies, as well as for last-half. There is much last-half tonnage yet unplaced, most of the buying for several months having been for delivery not more than three months ahead. Coke is dull at $4.75, Chicago.

Cleveland

July 10—Shipments of iron ore from the Lake Superior region in June reached a total of 4,826,505 long tons. This is 1141 tons more than in May, but 2,490,087 tons less than in June, 1910. For the season to July 1 the total shipments were 14,918,258 tons in 1910, and 8,842,908 in 1911; a decrease of 6,075,350 tons. A few more vessels have gone into commission, and better business this month seems probable.

Pig Iron—There are more inquiries coming in; some of them are to test the market only, but a number are likely to result in business. Basic seems to be in best demand. Quotations, Cleveland delivery, are $15.90 for bessemer, $14.25 for No. 2 foundry, $14.35 for No. 2 Scuthern and $13.25 for forge.

Finished Material—Specifications are coming in quite freely and there is a fair amount of new business showing up. Sheets and wire are quite active and structural steel shows a number of small orders.

Philadelphia

July 12—The week's business in pig iron fell below what was indicated, so far as small buyers are concerned. Two or three large buyers—among them the Pennsylvania Railroad—purchased three months' supplies of special brands. The most active on the list are malleable and pig iron for cast pipe, in which large deals were closed for buyers near by, and as far off as New England. Outside of these sales the aggregate of business was far below the average. The inquiries received this week point to the possibilities of large sales in basic and malleable, as well known consumers are asking for prices, deliveries to extend to the close of the year. In forge no business worth noting has been closed. Southern irons are interfering less than for several weeks. Local makers deny there will be any further curtailment of output in this territory. Foundry interests are at present out of the market. Best No. 2 X sold today at $16; some No. 2 Southern is offered at $15. Gray forge can be had at $14.50 per ton.

Steel Billets—Both open-hearth and forging are selling a little better in small, immediate-delivery lots.

Bars—Stores report a brisker retail trade. Mill agents report no large orders except at two or three mills, where common iron for car work was captured at a shading.

Plates—Considerable new business that has been hanging fire for a while has just been closed, and still more business, incident to car building, is in a fair way of being closed. The aggregate of new steel-plate business for early July foots up well.

Structural Material—The week's business was largely in small orders for general construction. Several lots, aggregating 1300 tons, mostly for local delivery, were sent to the mills.

Scrap—Sales of light and heavy scrap the last week overlap the aggregate sales of the last month. Prices have sagged, so mills and foundries have taken advantage of the drop.

Pittsburg

July 11—The finished steel trade is still working under the impetus of the sharp though not very extensive improvement in June. While new business is somewhat lighter, specifications are coming in quite freely on orders placed in June, as a considerable part of that business was for slightly forward delivery, and on the whole the finished-steel business is more brisk than it was early in June or during May. This showing, in the first fortnight of July, when usually business is extremely dull, is held to augur very well for the second half of the year as a whole, and a further and more marked picking up is expected in August or early in September. Prices are firmly held all along the line.

The Western Bar Iron Association signed the Amalgamated Association scale for its iron mills at a two days' conference at Cambridge Springs, Penn., Thursday and Friday of last week, the scale being substantially the same as the old one, which had been accepted by the Republic Iron and Steel Company last month. This winds up the scale issues of the Amalgamated Association, while the United Sons of Vulcan, an organization of puddlers only, is getting its scale signed by the various mills which recognize it.

Pig Iron—Nothing has come yet of the large inquiries for basic iron reported last week, and much of the 60,000 tons spoken of in the market is probably of a tentative character. The basic iron market is in a very unsettled condition. Two furnaces which were making low prices last month, under $13, Valley, assert positively that they have withdrawn all low quotations, and nominally the market today is at $13.25, Valley. It seems to be the general idea of furnaces that this price at least should be obtained, and efforts are being made to tighten the lines so that the figure will not be shaded. Bessemer is firm at $15, Valley, the market being apparently cleaned up of the odd lots which were being sold from time to time at slight cuts. Foundry iron shows a little more life. The Westinghouse Electric and Manufacturing Company is inquiring for a round tonnage for delivery at its Allegheny and Cleveland plants, September to March inclusive. We quote: Basic (nominal) $13.25; bessemer, $15; No. 2 foundry, $13.50@13.75; malleable, $13.25@13.50; forge, $13@13.25, all at Valley furnaces, 90c. higher delivered Pittsburg.

Ferromanganese—The market is rather quiet, but some buying by steel works is expected for second half. We continue to quote prompt and forward at $36.50, Baltimore.

Steel—Deliveries on contracts for billets and sheet bars are good, particularly the latter, as the sheet mills are running better than for many weeks. New sales are light. Little fresh business has been brought out by the reduction of $2 a ton in rods, May 29, but specifications are somewhat heavier on contracts, which have been adjusted to this basis in all cases in which they have been above it. We quote billets at $21 and sheet bars at $22, f.o.b. maker's mill, Pittsburg or Youngstown, and rods at $27, Pittsburg.

Sheets—The market has held its own after the improvement in June, and as specifications are coming in well the mills are running better than for many weeks, some of them being at full capacity. Prices are strictly held, and we quote: Black sheets, 28 gage, 2c.; galvanized, 3c.; blue annealed, 10 gage, 1.50c.; painted corrugated, $1.40; galvanized $2.55 per square.

St. Louis

July 10—The market is still rather dull. Inquiries are coming in, but actual sales are not large. Prices remain at $10@10.25 Birmingham—$13.75@14 St. Louis—for No. 2 foundry, with most sales at the lower figure.

METAL MARKETS

New York, July 12—The metal markets have been generally quiet with no special incident to be noted.

MONTHLY INDEX NUMBERS

Month	1910	1911	Month	1910	1911
January	127	110	July	112	.....
February	124	115	August	113	.....
March	118	112	September	114	.....
April	118	114	October	111	.....
May	113	118	November	117	.....
June	107	115	December	115	.....

Year 1909, 115; 1910, 115.
Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
May 1911	$6,817,149	$ 5,014,740	Exp. $ 1,802,409
" 1910	718,678	3,143,338	Imp. 2,424,660
Year 1911	10,176,807	29,004,012	Imp. 18,827,205
" 1910	47,918,384	14,812,614	Exp. 33,105,770
Silver:			
May 1911	5,054,304	3,555,543	Exp. 1,498,761
" 1910	4,130,754	3,354,715	" 776,039
Year 1911	28,665,500	18,451,559	" 10,213,946
" 1910	22,466,835	18,593,349	" 3,873,481

Exports from the port of New York, week ended July 8: Gold, $10,725; silver, $1,088,116, chiefly to London. Imports: Gold, $98,088, from Australia and South America; silver, $41,809, from South America.

Gold—The price of gold on the open market in London was unchanged, at 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. Some of the gold arriving was taken for Germany, the rest going to India and the Bank of England.

Gold production in the Transvaal in June is reported by cable at 684,000 oz. —$14,138,280—being 1951 oz. less than in May. For the half-year ended June 30, this makes the total output $82,175,342 in value; an increase of $6,471,364 over the first half of last year.

Platinum—The market is steady, with business fair for the season. Prices are unchanged, dealers asking $42.50@43 per oz. for refined platinum, and $45@45.50 per oz. for hard metal.

Iridium—Prices are a trifle easier, $60@62 per oz. being asked for pure metal.

Silver—The tone of the market has been quiet but steady. The price in London has fluctuated between 24 5/16 and 24 7/16d. The activity in the Indian Bazaars has been affected by the interruption of the rains and the consequent uncertainty as to whether the Monsoon would be satisfactory.

SILVER AND STERLING EXCHANGE

July	6	7	8	10	11	12
New York	52¾	52⅝	52⅞	53	53	52⅞
London	24⅜	24 7/16	24⅜	24 7/16	24 7/16	24⅜
Sterling Ex.	4.8610	4.8625	4.8625	4.8625	4.8630	4.8630

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, from Jan. 1 to June 29, reported by Messrs. Pixley & Abell:

	1910	1911	Changes
India	£2,757,000	£4,292,700	I. £1,535,700
China	1,113,500	822,800	D. 290,700
Total	£3,870,500	£5,115,500	I. £1,245,000

India Council bills in London brought an average of 16d. per rupee for the week.

Copper, Tin, Lead and Zinc

NEW YORK

July	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
	12 70	12 45			4 37½	5 65	5 50
6	@12 80	@12 50	43⅛	4 50	@4 40	@5 70	@5 55
	12 70	12 45			4 37½	5 65	5 50
7	@12 80	@12.50	43⅛	4.50	@4 40	@5 70	@5 55
	12 70	12 45			4 37½	5 65	5 50
8	@12 80	@12 50	43⅛	4.50	@4 40	@5 70	@5 55
	12 70	12 45			4 37½	5 65	5 50
10	@12 80	@12 50	42⅝	4 50	@4.40	@5.70	@5 55
	12 70	12 45			4 37½	5 65	5 50
11	@12 80	@12.50	42⅝	4.50	@4 40	@5.70	@5 55
	12 70	12 45			4 37½	5 65	5 50
12	@12.80	@12 50	42⅝	4.50	@4 40	@5 70	@5 55

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transac"ons in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

July	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
6	56 13/16	57 3/8	60 3/4	194 1/2	189	13 5/16	24 3/4
7	56 3/4	57 5/16	60 3/4	195	188 1/2	13 3/8	24 3/4
8	.....	.....	.....	.....	.....	....	....
10	57 1/8	57 5/8	61 1/4	195 3/4	188 1/2	13 5/16	25
11	57 1/4	57 13/16	61 1/4	195 1/2	188 3/4	13 5/16	25
12	57 1/16	57 5/8	61 1/4	195 3/4	188 3/4	13 3/8	25

The aboe table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £ = 5c.; £60 = 13.40c. ± £1 = ± 0.21¾c.

Copper—Under the influence of a little more business than in the previous week prices have been well maintained. The transactions in electrolytic have been mostly on the basis of 12⅝c., delivered, usual terms, but at the close some sellers who had been disposing of copper at that price were asking a higher figure. The attitude of most of the agencies is to await quietly a new spurt in demand, all of them having disposed of such quantities in June as to put them in a comfortable position. A fair business was done this week in Lake, the bulk of the sales being at 12.75. Were it not for the enervating influence of the extreme heat, the efforts of large speculative interests to advance the London standard market might have had a stronger reflection in consumers' business. The close is steady at 12.70@12.80c. for Lake copper, and 12.45@12.50c. for electrolytic in cakes, wirebars and ingots. Casting copper is quoted nominally at 12¼@12⅜ cents.

So far as we can learn, none of the copper of the Miami, Ray and Bonanza mines has yet been offered for sale.

Copper sheets are 18@19c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill. This price is shaded, however, orders being still taken at 13¾c. quite freely.

Exports of copper from New York for the week were 9765 long tons. Our special correspondent gives the exports from Baltimore for the week at 3558 tons.

The London standard market shows a good advance for the week under heavy buying against orders which are reported to have come from this side of the water. The close is cabled at £57 1s. 3d. for spot, and £57 12s. 6d. for three months.

Tin—The market in London has been very dull, but steady. Transactions remain small and speculation seems for the present to be almost entirely absent. The close is cabled at £195 15s. for spot, and £188 15s. for three months.

In the domestic market business is restricted to retail lots for spot delivery. Larger arrivals here have made supplies more plentiful and have done away with the larger part of the premium. July tin is quoted at about 42⅝c., while spot material can be had at about 43¾ cents.

Lead—The accumulations of Western lead appear to have been well absorbed, and while business does not show much of an increase, outside supplies are small. The market has moved up to 4.50c., New York, and 4.37½@4.40c., St. Louis.

The London market is steady at £13 7s. 6d. for Spanish, and £13 10s. for English lead.

Spelter—There has been a little more business doing, under which prices have stiffened slightly, the close being steady at 5.65@5.70c., New York, and 5.50@5.55c., St. Louis.

Zinc dust is quoted at 6¾c. per lb., New York.

The London market is again firmer, the syndicate having raised its quotation there to £25 for good ordinaries, and £25 5s. for specials.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, less 8 per cent. discount.

Imports and Exports of Metals

Exports and imports of metals in the United States, five months ended May 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports	Imports	Excess
Copper, long tons	137,318	63,397	Exp. 73,921
Copper, 1910....	105,627	63,791	Exp. 41,836
Tin, long tons....	530	21,648	Imp. 21,118
Tin, 1910.... ...	252	20,253	Imp. 20,001
Lead, short tons.	39,045	39,408	Imp. 363
Lead, 1910.....	20,355	44,298	Imp. 23,943
Spelter, sh. tons.	3,685	943	Exp. 2,742
Spelter, 1910....	641	1,213	Imp. 572
Nickel, lb.....	10,006,906	11,656,952	Imp. 1,650,046
Nickel, 1910....	6,267,762	13,913,289	Imp. 7,645,527
Antimony, lb.....	160,844	4,264,796	Imp. 4,103,952
Antimony, 1910.	551	4,096,057	Imp. 4,095,506
Platinum, oz.....	47	38,773	Imp. 38,726
Platinum, 1910.	47	43,241	Imp. 43,194
Aluminum, value	$540,633	.....	Exp. $540,633
Aluminum, 1910	183,180	.....	Exp. 183,180
Ores, etc.:			
Zinc oxide, lb. .	11,602,471	.....	Exp. 11,602,471
Zinc oxide, '10..	11,420,123	.....	Exp. 11,420,123
Zinc dross, lb....	4,023,416	.....	Exp. 4,023,416
Zinc dross, '10..	5,248,512	.....	Exp. 5,248,512
Zinc ores, lg. tons	8,336	19,395	Imp. 11,059
Zinc ores, 1910.	8,518	29,583	Imp. 21,065
Chrome ore, tons	5	16,479	Imp. 16,474
Chrome ore, '10	30	18,848	Imp. 18,818

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Imports of aluminum are not given. The exports given above include reëxports of foreign material. Zinc contents of ores imported were 22,428,586 lb. in 1910, and 12,945,684 lb. this year. There were reëxported foreign ores containing 724,055 lb. zinc in 1910, and 1,302,120 lb. this year.

Other Metals

Aluminum—The market is still quiet, with no recent change. Quotations are 20@20¼c. per lb. for No. 1 ingots, New York.

Antimony—Business has been quiet, with small sales. Dealers are unwilling to sell far ahead. Cookson's is quoted at 8.50c. per lb. and Hallett's at 8c. For outside brands prices are uncertain, and 7.20@7.50c. per lb. is named for Hungarian and Chinese.

Quicksilver—Sales are fair, with supplies still rather light. Prices have been advanced. New York quotation is up $3, to $47 per flask of 75 lb. San Francisco, $46@46.50 for domestic orders, and $43.50@44 for export. London quotations have been advanced 7s. 6d., and are now £8 15s. per flask, with £8 7s. 6d. named from second hands.

Cadmium—This metal is quoted at works in Germany at 725@750 marks per 100 kg.—equal to 78.3@81c. per lb.—according to size of order.

Zinc and Lead Ore Markets

Platteville, Wis., July 8—The highest price paid this week for zinc ore was $44; the base price, 60 per cent. zinc, was $42.50@43. The base price paid for 80 per cent. lead ore was $54@55 per ton.

SHIPMENTS, WEEK ENDED JULY 8

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	714,000	.....	.....
Platteville.....	504,650	.....	313,900
Galena.....	491,800	.....	.....
Benton.....	394,100	.....	.....
Highland.....	190,600	66,600	.....
Shullsburg.....	149,000	.....	.....
Dodgeville.....	140,000	.....	.....
Hazel Green.....	100,200	.....	.....
Montfort.....	64,000	.....	.....
Harker.	63,330	.....	.....
Total.....	2,811,680	66,000	313,900
Year to date.....	77,215,989	4,529,735	17,795,210

Shipped during week to separating plants, 1,874,400 lb. zinc ore.

Joplin, Mo., July 8—The high price of zinc sulphide ore was $45, and the base price was $40@43 per ton of 60 per cent. zinc. Zinc silicate ore sold at $20@23 per ton of 40 per cent. zinc. The average of all grades of zinc was $37.32. The high price of lead was $59, the bulk of the ore selling around $58@58.50. The

SHIPMENTS, WEEK ENDED JULY 8

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,255,580	.....	647,600	$85,518
Joplin	1,853,260	.....	245,900	48,050
Miami.....	1,845,730	.....	144,710	31,882
Galena.....	665,550	.....	76,780	15,870
Alba-Neck....	627,700	.....	36,810	14,248
Granby.....	204,990	663,940	1,480	11,330
Spring City..	114,740	235,530	121,310	8,286
Oronogo.....	247,500	.....	94,260	7,773
Duenweg.....	198,270	.....	72,080	6,149
Jackson.....	134,160	.....	78,210	4,951
Aurora.....	57,690	119,970	.....	2,530
Carl Junction	111,420	.....	.....	2,450
Quapaw.....	114,620	.....	.....	2,177
Sarcoxie.....	78,450	61,110	.....	2,100
Cave Springs.	65,570	.....	.....	1,376
Stott City.....	58,250	.....	.....	1,223
Carthage.....	....	53,350	10,430	835
Badger.....	48,130	.....	.....	562
Totals.....	9,681,710	1,133,900	1,529,570	$246,310
27 weeks...	265,874,420	18,521,510	46,124,400	$6,715,419
Blende val., the week,	$189,229;	27 weeks,		$5,213,243
Calamine, the week,	12,666;	27 weeks,		215,176
Lead value, the week.	44,415;	27 weeks,		1,287,000

average, all grades of lead, was $58.03 per ton.

The large surplus at Miami, Okla., is sold and a good part of it has been shipped, leaving but two large bins of ore in the district, and these are not classed as marketable ore because the holders are still asking $50 per ton—nearly $10 above the present market value. This week's shipment is above the average, but the output was decreased more than a sixth, as no work was done at any mines on the Fourth, while at many mines no work was done from Saturday until Wednesday, and some mines were shorthanded even on Wednesday.

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1910	1911	1910	1911	1910	1911
January	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February	40.69	40.21	39.47	39.16	53.64	54.46
March	43.60	39.85	39.71	38.45	51.26	54.77
April	41.00	38.88	39.33	37.47	49.72	56.37
May	40.19	38.25	37.51	36.79	48.16	55.21
June	40.20	40.50	37.83	38.18	48.80	56.49
July	39.63	.....	36.80	.....	48.59	.....
August	40.13	.....	37.32	.....	49.75	.....
September	43.45	.....	39.96	.....	54.73	.....
October	43.31	.....	40.50	.....	53.18	.....
November	47.20	.....	43.20	.....	54.80	.....
December	42.50	.....	40.70	.....	55.70	.....
Year	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, July 12—The general market is quiet, with no especial features.

Imports and Exports—Imports and exports of chemicals and raw material in the United States, five months ended May 31:

	Imports	Exports	Excess
Copper sulph. lb.	.....	6,088,542 E.	6,088,542
Copper sul., '10	.....	3,122,187 E.	3,122,187
Bleach, lb.	39,536,249	17,368 I.	39,518,881
Bleach, 1910	41,288,994	..... I.	41,288,994
Potash salts, lb.	340,289,824	2,076,902 I.	338,212,922
Potash salts, '10	265,045,483	1,947,106 I.	263,098,377
Soda salts, lb.	15,015,926	238,655 I.	14,777,271
Soda salts, 1910	15,509,619	239,599 I.	15,270,020
Acetate lime, lb.	.....	32,088,260 E.	32,088,260
Acetate, 1910	.....	28,152,746 E.	28,152,746
Nit. of soda, tons	272,162	3,190 I.	268,972
Nitrate, 1910	231,593	2,820 I.	228,773
Phosphates, tons	.....	498,271 E.	498,271
Phosphates, '10	.....	415,912 E.	415,912
Sulphur, tons	10,602	4,786 I.	5,816
Sulphur, 1910	13,541	15,234 E.	1,693
Pyrites, tons	412,429	..... I.	412,429
Pyrites, 1910	232,989	..... I.	232,989
Magnesite, lb.	122,936,944	1,113,057 I.	121,823,887
Magnesite, 1910	78,916,280	2,612,172 I.	76,304,108
Sul. ammonia, lb.	89,922,054	..... I.	89,922,044
Sul. am'nia, '10	67,474,246	106,000 I.	67,368,246
Arsenic, lb.	2,119,879	..... I.	2,119,879
Arsenic, 1910	3,417,799	2,251 I.	3,415,548

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites, the total imports of sulphur this year were 175,573 tons.

Copper Sulphate—Demand is good and supplies are again rather light. Prices are unchanged at $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller orders.

Arsenic—The market is unchanged. White arsenic for early delivery is $2 per 100 lb., while $1.75 is named for futures.

Nitrate of Soda—Business continues good and prices firm at 2.12½c. per lb. for spot and 2.15@2.17½c. for futures.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on July 1 as follows, in long tons:

	1910	1911	Changes
Stocks, Jan. 1	12,790	14,000	I. 1,210
Imports, 6 mos	260,100	293,240	I. 33,140
Total supply	272,890	307,240	I. 34,350
Deliveries, 6 mos	258,300	301,690	I. 43,390
Stocks, July 1	14,590	5,550	D. 9,040
Afloat for U. S.	75,000	75,000	.....

Quantities afloat include all cargoes due to arrive at United States ports up to Oct. 15 next.

MINING·STOCKS $

New York, July 12—The general stock market has been quiet, with rather light transactions and very few price changes of any importance. The vacation season and the extreme heat have combined to produce dullness, and the public has taken little interest.

One sale of Homestake was reported, 100 shares at $83.50 per share.

The stock of the Virginia Coal and Iron Company had a sharp rise on the Exchange under persistent buying. It rose 10 points, to 84. In January it sold at 52. The buying gave rise to rumors that the company was to be acquired by the Steel Corporation; but these were denied. Later the stock went up to 97, but reacted to about 81 at the close.

Trading on the Curb in mining stocks was also quiet. Kerr Lake and La Rose showed some vitality among the Cobalt stocks. Dealings in Braden Copper were quite heavy, but not much attention was paid to other copper shares. Other mining stocks were slow.

At auction in New York, July 5, a lot of 10,000 shares Barnes-King Development Company, Montana, $5 par, brought $130; $172,000 La France Copper Company first mortgage bonds, $210; 1000 shares Great Southern Petroleum Company, $10 par, $500 for the lot; 5000 shares Ohio Copper Company, $10 par, $1.75 per share.

Boston, July 11—Even the favorable copper showing for June failed to have any influence on the share market. Prices hold stubbornly strong, but the market lacks outside interest and is consequently extremely dull. There have been no market features during the week. Under Calumet & Hecla management the Osceola company has reduced its dividend rate from $8 to $7 per year by the declaration of $3.50 for the half year. Osceola's copper costs for the first half of the current calendar year were the lowest on record, being slightly above 9c. per lb. The $3.50 dividend was earned and a small balance carried over. Calumet's large ownership of Osceola brings a revenue to the former of over $140,000 from this declaration.

Curb trading has been quiet and did not bring out any noteworthy feature. Raven fell to a low of 18c. on the an-

COPPER PRODUCTION REPORTS

Copper contents of blister copper, in pounds

Company	April	May	June
Anaconda	21,500,000	22,100,000	21,850,000
Arizona, Ltd.	2,840,000	2,800,000	.....
Balaklala	880,921	978,426	.....
Copper Queen	6,933,422	7,140,196	7,088,862
Calumet & Ariz.	3,850,000	3,854,000	3,656,000
Detroit	1,814,740	1,709,530	1,732,692
East Butte	1,085,000	1,135,000	.....
Nevada Con.	5,298,632	5,277,355	5,307,400
Old Dominion	2,535,000	2,363,000	.....
Shannon	1,258,000	1,229,760	1,098,000
South Utah	300,137	318,350	.....
United Verde*	2,500,000	3,000,000	.....
Utah Copper Co.	8,169,248	8,391,879	7,958,685
Lake Superior*	16,000,000	19,000,000	.....
Non-rep. mines*	11,825,000	13,280,000	.....
Total production	86,790,160	92,577,496	.....
Imports, bars, etc.	25,655,122	19,481,190	.....
Total blister	112,445,222	112,058,686	.....
Imp. in ore & matte	5,207,484	6,801,365	.....
Total	117,652,706	118,860,051	.....
Brit. Col. Cos.:			
British Col. Copper	952,284	.....	.....
Granby	1,825,340	1,238,328	.....
Mexican Cos.:			
Boleo	2,403,520	2,411,500	2,315,040
Cananea	3,644,000	4,098,000	3,462,000
Moctezuma	2,315,292	2,403,583	2,271,960
Other Foreign:			
Spassky, Russia	506,240	586,880	.....
Exports from:			
Chile	5,152,000	7,392,000	.....
Australia	5,936,000	11,088,000	.....

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries, for Export
VI, 1910	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424,316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,126	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599
V	126,962,544	64,543,963	61,978,557
VI	124,554,312	61,655,561	71,460,519

VISIBLE STOCKS.

	United States.	Europe.	Total.
VII, 1910	168,386,017	232,892,800	401,278,817
VIII	170,640,678	222,320,000	392,960,675
IX	168,881,245	218,444,800	387,326,046
X	148,793,714	211,276,800	360,070,519
XI	139,261,914	198,060,800	337,322,711
XII	130,389,069	193,200,000	323,589,095
I, 1911	122,030,195	236,629,120	358,649,373
II	142,439,490	236,992,000	379,431,134
III	156,637,770	233,385,600	390,023,009
IV	162,007,934	223,014,400	385,022,434
V	165,555,908	212,284,800	377,840,708
VI	165,995,932	202,540,800	368,536,732
VII	157,434,164	195,932,800	353,366,964

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

nouncement of another 25c. assessment. Amalgamated-Nevada was the most active issue on the Curb with sales of over 50,000 shares and a 2½c. advance. Corbin copper begins to show strength and activity. Davis Daly holds weak around 90c. per share.

Assessments

Company	Delinq	Sale	Amt
Alta, Utah	July 13	Aug. 3	$0.05
Bullion, Ida	July 17	Aug. 17	0.005
Chollar, Nev	July 18	Aug. 10	0.10
Dennemora, Ida	June 26	July 26	0.002
Humming Bird, Ida	July 7	Aug. 7	0.002½
Hypotheek, Ida	July 28	Aug. 19	0.C05
Ivanhoe, Ida	July 10	Aug. 10	0.004
Julia Con., Nev	June 29	July 27	0.05
Laclede, Ida	July 8	July 31	0.003
Lucky Calumet, Ida	June 24	July 24	0.005
Mass, Mich	June 15		2.00
National, Ida	July 7	Aug. 1	0.01
Nine Mile, Ida	June 25	July 30	0.001
Old Colony, Mich	June 26		1.00
Oreano, Ida	Aug. 1	Sept. 1	0.003
Sierra Nevada, Nev	July 21	Aug. 11	0.10
Silver Star, Ida	July 10	Aug. 11	0.002
Snowstorm Extension, Ida.	June 22	July 24	0.003
Sonora, Ida	June 30	July 23	0.001
Temple, Ida	June 27	July 26	0.002
Trans.-Continental, Ida	June 30	July 22	0.002
Treasure, Cal	July 7	July 31	0.05
Tyler, Ida	July 7	Aug. 8	0.001
Union Con., Nev	July 12	Aug. 4	0.15
Utah Mining, Nev	July 10	July 31	0.05
Utah United Copper, Utah.	June 24		0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.			London.		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24 865
February	51.472	51.534	52 222	23.706	23.794	24 081
March	50.468	51.454	52.745	23.227	23.690	24 324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870	53.308	24.343	24.797	24 583
June	52.538	53.462	53.043	24.166	24.651	24.486
July	51.043	54.150	.....	23.519	25.034	.....
August	51.125	52.912	.....	23.588	24.428	.....
September	51.440	53.295	.....	23.743	24.567	.....
October	50.923	55.490	.....	23.502	25.596	.....
November	50.703	55.635	.....	23.351	25.680	.....
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London, Standard.	
	Electrolytic		Lake.			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12 295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12 611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54 704
April	12.733	12.019	13.091	12 275	57 2/8	54.035
May	12.550	11.989	12.885	12 214	56 3/8	54 313
June	12.404	12 385	12.798	12 611	55 3/8	56 368
July	12.215	.....	12.570	.....	54.194	.....
August	12.490	.....	12.715	.....	55.733	.....
September	12.379	.....	12 668	.....	55.207	.....
October	12.553	.....	12.788	.....	56.722	.....
November	12.742	.....	12 914	.....	57 634	.....
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN AT NEW YORK

Month.	1910.	1911.	Month.	1910.	1911.
January	32.700	41.255	July	32.695	.....
February	32 920	41 614	August	33.972	.....
March	32.463	40.157	September	34.982	.....
April	32.976	42 185	October	36.190	.....
May	33.125	43.115	November	36 547	.....
June	32.769	44.606	December	38.199	.....
			Av. Year	34 123	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4 412	4.225	4.262	12.641	12.889
May	4.315	4.373	4.164	4.223	12.550	12.984
June	4.343	4.435	4.207	4.292	12.688	13.260
July	4.404	.....	4.291	.....	12.531	.....
August	4.400	.....	4.290	.....	12.513	.....
September	4.400	.....	4.289	.....	12.582	.....
October	4.400	.....	4.271	.....	13.091	.....
November	4.442	.....	4.314	.....	13.217	.....
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5 518	5.419	5 368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5 399	5.289	5.249	22.469	23.743
May	5.191	5.348	5.041	5.198	22.100	24.375
June	5.128	5.520	4.978	5.370	22.094	24.612
July	5.152	.....	5.002	.....	22.406	.....
August	5.279	.....	5.129	.....	22.800	.....
September	5.514	.....	5.364	.....	23.165	.....
October	5.628	.....	5.478	.....	23.900	.....
November	5 976	.....	5.826	.....	24.083	.....
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23.050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer		Basic		No. 2 Foundry	
	1910	1911	1910	1911	1910	1911
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	15 90	16.84	14.65	16.75	15.00
May	17.10	15.90	15.94	14.30	16.18	14.72
June	16.52	15.90	15.60	14.06	15.53	14.56
July	16.40	.....	15.40	.....	15.40	.....
August	16.09	.....	14.89	.....	15.16	.....
September	15.92	.....	14.73	.....	14.93	.....
October	15.90	.....	14.05	.....	14.88	.....
November	15.84	.....	14.26	.....	14.78	.....
December	15.90	.....	14.15	.....	14.65	.....
Year	$17.10	.....	$15.65	.....	$15.83	.....

STOCK QUOTATIONS

COLO. SPRINGS July 11

Name of Comp.	Bid.
Acacia	.03½
Cripple Cr'k Con.	.01½
C. K. & N.	.10
Doctor Jack Pot	.05⅞
Elkton Con	.60
El Paso	.48
Findlay	.03
Gold Dollar	.10½
Gold Sovereign	.02½
Isabella	.10½
Jack Pot	.05
Jennie Sample	.09
Lexington	‡.01
Moon Anchor	.02¾
Old Gold	.02½
Mary McKinney	.35
Pharmacist	‡.01
Portland	.97
Vindicator	.72
Work	.02

SALT LAKE July 11

Name of Comp.	Bid.
Beck Tunnel	.24
Black Jack	.13
Carisa	.15
Cedar Talisman	.04½
Colorado Mining	.48
Columbus Con	.33
Daly Judge	4.25
Grand Central	.79
Iron Blossom	1.20
Little Bell	.43
Lower Mammoth	.02½
Mason Valley	8.50
May Day	.09½
Nevada Hills	3.40
New York	‡.13½
Prince Con	.74
Silver King Coal'n	1.50
Sioux Con	.27
Uncle Sam	.47
Yankee	.10

TORONTO July 11

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.25	Pearl Lake	.63
Hudson Bay	.75	Porcu. Gold	.61½
Temiskaming	.39	Porcu. Tisdale	.07
Wettlaufer-Lor	1.00	Preston E. D.	.39
Apex	.21½	West Dome	2.00
Central	.84	Standard	.08
Dobie	2.50	Canada	‡1.10
Dome Exten	.88	Rea	5.90
Hollinger	14.25	Coronation	.35
Imperial	.14	Swastika	.60½

SAN FRANCISCO July 11

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	6.25
Belcher	.50	Jim Butler	.27
Best & Belcher	.39	MacNamara	.18
Caledonia	.51	Midway	.17
Challenge Con	.22	Mont.-Tonopah	.70
Chollar	.10	North Star	.14
Confidence	.74	West End Con	.51
Con. Virginia	1.15	Atlanta	.15
Crown Point	.35	Booth	.07
Gould & Curry	.18	C.O.D. Con	.06
Hale & Norcross	.20	Comb. Frac	.08
Mexican	3.55	Jumbo Extension	.18
Occidental	.65	Oro	.04
Ophir	2.30	Silver Pick	.04
Overman	.48	St. Ives	.16
Potosi	.23	Tramps Con	.02
Savage	.21	Argonaut	2.00
Sierra Nevada	.38	Bunker Hill	7.00
Union Con	1.45	Cent. Eureka	1.07
Yellow Jacket	.35	So. Eureka	7.00

N. Y. EXCH. July 11

Name of Comp.	Clg.
Amalgamated	69⅛
Am. Agri. Chem	56½
Am.Sm.&Ref.,com	80
Am. Sm.& Ref., pf.	107
Anaconda	39¾
Batopilas Min	1½
BethlehemSteel pf	63⅛
Chino	23¾
Comstock Tunnel	‡.27
Federal M.& S., pf.	64½
Goldfield Con	5½
Great Nor., ore ctf.	61
Homestake	82½
Miami Copper	21⅜
Nat'nalLead,com.	55⅛
National Lead, pf.	105½
Nev. Consol	19½
Pittsburg Coal, pf.	84⅞
Ray Con	17¼
RepublicI&S,com	29⅜
Republic I & S, pf.	93½
SlossSheffi'd,com.	48
Sloss Sheffield, pf.	‡112
Tennessee Copper	41
Utah Copper	50
U. S. Steel, com	79½
U. S. Steel, pf	118⅞
Va. Car. Chem	55½

N. Y. CURB July 11

Name of Comp.	Clg.
Barnes King	‡.15
Braden Copper	5
B. C. Copper	5⅛
Buffalo Mines	‡1.60
Butte & Vipond	.54
Butte Coalition	19
Calumet & Mont.	‡.20
Cobalt Central	.03
Con. Ariz. Sm.	1¼
Davis-Daly	⅞
Ely Con	½
Florence	1⅞
Giroux	6½
Greene Cananea	7½
Greenwater	.05
Guanajuato	‡3¼
Guerrero	‡1⅛
Guggen. Exp.	.205
Inspiration	83¾
Internat. S. & R.	‡124
Kerr Lake	5⅛
La Rose	4¼
McKinley-Dar-Sa.	13⅜
Min. Co. of A. new	5⅜
Moneta Porc	.20
Mont Shoshone	‡.04
Nev. Utah M. & S.	1½
New Baltic	6⅜
Nipissing Mines	10¼
Ohio Copper	1⅜
Pacific Sm. & M.	¼
Precious Metals	‡⅛
Ray Central	1⅜
Red Warrior	‡1½
South Utah M. & S.	¾
Standard Oil	645
Stewart	.97
Tonopah	5¾
Tonopah Ex	.92
Tri-Bullion	⅜
Tularosa	⅜
Union Mines	‡7/16
Yukon Gold	4

LONDON July 12

Name of Com	Clg.
Camp Bird	£1 9s 6d
Dolores	1 10 0
El Oro	1 3 9
Esperanza	1 15 0
Mexico Mines	7 12 6
Oroville	0 6 0
Stratton'sInd.	0 2 3
Tomboy	0 18 1½

BOSTON EXCH. July 11

Name of Comp.	Clg.
Adventure	6¼
Algomah	9¾
Allouez	30
Am. Zinc	28¾
Arcadian	3⅜
Arizona Com	16
Atlantic	‡6
Bonanza	.50
Boston & Corbin	14
Butte & Balak	4¾
Calumet & Ariz	58½
Calumet & Hecla	466
Centennial	12
Con. Mercur	‡.04
Copper Range	60½
Daly-West	5½
East Butte	14
Franklin	12
Granby	39½
Hancock	28
Hedley Gold	15¼
Helvetia	1
Indiana	14
Isle Royale	17
Keweenaw	2⅞
Lake	37¾
La Salle	3½
Mass	8¼
Michigan	2⅛
Mohawk	50
New Arcadian	3½
North Butte	33
North Lake	8¾
Ojibway	6½
Old Dominion	47½
Osceola	102
Parrot	12
Quincy	74
Shannon	11
Shattuck-Ariz	17
Superior	32
Superior & Bost.	5¾
Tamarack	34
Trinity	4
U. S. Smelting	38⅝
U. S. Smelt'g, pf.	48½
Utah Apex	2⅞
Utah Con	17
Victoria	2
Winona	8
Wolverine	112
Wyandot	1⅝

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Name of Comp.	Last
Ahmeek	165
Bingham Mines	1½
Boston Ely	1⅛
Boswyocolo	.07½
Cactus	.11
Calaveras	17
United Verde Ext.	.86
Chief Cons	1
Corbin	3⅞
Cortez	1½
Crown Reserve	3½
First Nat. Cop	1⅜
Live Oak	20
Majestic	.75
Mazatan	1½
Nat'l Mine & Ex.	.18
Nevada-Douglas	3½
Oneco	2¾
Raven Copper	.18
Rhode Island Coal	1¾
San Antonio	3½
South Lake	8
Trethewey	.75
Tuolumne Copper	4½
United Zinc, pfd.	‡2
Vulture	6
Yuma	‡.02

‡Last quotation.